The clinical utility of the electronic toilet-top bidet for
Australian nursing home residents and staff

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Faculty of Health Sciences

University of Sydney

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I, Meredith Gresham hereby declare that this submission is my own work and that, to the best of my knowledge, it contains no material previously published or written by another person, except where duly acknowledged in the text.

In addition, ethical approval from the University of Sydney Human Research Ethics Committee was granted for the respective studies presented in this thesis. All participants involved in the studies provided written consent prior to participating.

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Signed:

Date: 29th June, 2018

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As supervisor of Meredith Gresham’s doctoral work, I certify that I consider her thesis: “The clinical utility of the electronic toilet-top bidet for Australian nursing home residents and staff” to be suitable for examination.

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Abstract

Toileting is fundamental to independence. Inability to self-toilet has negative outcomes for older people and is a primary risk factor for admission to residential care.

In residential care, toileting is the most common task undertaken by staff. It is frequently a source of indignity for the care recipient. For people with dementia, toileting assistance may be interpreted as invasive and met with distress.

This work comprises an iterative, mixed methods investigation of the electronic, wash-and-dry toilet-top bidet, examining its feasibility and clinical utility to improve the toileting experience for older dependent people, staff and family carers.

A review of literature and three exploratory studies were undertaken. The first study used in-depth interviews to investigate experiences of five family carers with the bidet. The bidet was accepted if it met carers’ physical and symbolic needs. Ongoing use was mediated by environmental constraints, cleaning performance, reactions of the care recipient, and quality of interactions with health professionals. Carers reported it cleaned reliably, reduced incontinence and helped ‘normalise’ familial relationships.

The second was a single-arm feasibility study in a dementia specific aged care home (ACH). Bidets were feasible and acceptable for residents and staff, were reliable, and cleaned effectively. Staff workload and facility expenditure on incontinence products decreased.

Thirdly, a controlled pilot study was conducted in two Australian ACHs with 49 residents and 73 staff. Acceptability of the technology and reduction of staff workload were again observed. Further findings were improvement in resident behaviour during toileting and lower rates of constipation. No changes were found in incontinence associated dermatitis or odour. Residents in the bidet condition were more likely to have a clear case of bacteriuria or

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a probable urinary tract infection. However, higher rates of faecal incontinence, poorer function and cognition observed in baseline measures of the intervention group may have had a mediating effect on this result.

The studies have ecological validity and the bidet shows promise as a technology to improve the dignity and ease of the toileting experience. The outcomes of these studies have contributed to a more nuanced understanding of factors that influence uptake on ongoing use of assistive technologies in aged care settings and development of measures also provides a basis for future confirmatory studies.
Dissemination of Results

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Poster presentations:


Abbreviations and definition

The following terms were abbreviated within this thesis:

<table>
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<tbody>
<tr>
<td>ACH</td>
<td>Aged Care Home</td>
</tr>
<tr>
<td>ADL</td>
<td>Activities of Daily Living</td>
</tr>
<tr>
<td>AIN</td>
<td>Assistant in Nursing</td>
</tr>
<tr>
<td>AT</td>
<td>Assistive Technology</td>
</tr>
<tr>
<td>ASB</td>
<td>Asymptomatic Bacteriuria</td>
</tr>
<tr>
<td>EN</td>
<td>Enrolled Nurse, also known as Division 2 (Div. 2) in Victoria, Australia</td>
</tr>
<tr>
<td>GDS</td>
<td>Global Deterioration Scale</td>
</tr>
<tr>
<td>HC-RAT</td>
<td>HammondCare – Resident Assessment Tool</td>
</tr>
<tr>
<td>IAD</td>
<td>Incontinence associated dermatitis</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standards Organisation</td>
</tr>
<tr>
<td>NASA-TLX</td>
<td>National Aerospace Agency – Task Load Index</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales, Australia</td>
</tr>
<tr>
<td>PIS</td>
<td>Participant Information Statement</td>
</tr>
<tr>
<td>RN</td>
<td>Registered Nurse, also known as Division 1 (Div. 1) in Victoria, Australia</td>
</tr>
<tr>
<td>UTI</td>
<td>Urinary Tract Infection</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>Vic</td>
<td>Victoria, Australia</td>
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Statistical abbreviations used within this thesis:

<table>
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<tr>
<td>N, n</td>
<td>Number</td>
</tr>
<tr>
<td>M, m</td>
<td>Mean</td>
</tr>
<tr>
<td>SD</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>p</td>
<td>Level of significance</td>
</tr>
<tr>
<td>χ²</td>
<td>Chi-Square</td>
</tr>
<tr>
<td>Z</td>
<td>Wilcoxon sign ranks test statistic</td>
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Definition:

At the time of writing, no concise term exists in the scientific literature that refers to any method of cleaning (e.g. use of toilet paper, ‘wet wipes’ or water washing) after any type of elimination of urine or faeces, regardless of the occurrence of incontinence. The phrase ‘post-voiding cleaning’ is used in this thesis to refer to any type of cleaning of the perineum or perianal area after elimination of waste from the body.
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### Chapter 5

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Chapter 1 Introduction

The Australian population is ageing. The greatest proportional increases are projected to be in the oldest age brackets. In 2012 those aged over 75 years represented around 6.4% of the Australian population. By 2060 this cohort will have increased to about 14.4% of the population, approximately 4 million people [1]. Population ageing should be celebrated as a triumph of successful social policies and public health practices that have improved and are continuing to improve longevity. However, older age is associated with greater burden of disease, and with advancing age older people are more likely to experience limitations in activities of daily living (ADL) including basic or core activity restrictions in dressing, bathing and using the toilet [2, 3].

The ability to perform core self-care activities is essential to independent living. The most frequent of these activities is toileting [4]. Toileting includes not only getting to and from the toilet and appropriate voiding of bladder and/or bowels, but also removal of remaining liquid or solid matter from the skin after voiding. Inability to manage cleaning adequately may result in negative biological, social and psychological outcomes for the older person. These include malodour, breakdown of perineal skin [5], infections [6], social exclusion, [7] embarrassment [8], and the indignity of having another person complete this task [9]. Particularly for the older person living with cognitive limitations, such as dementia, having another person clean after voiding may be interpreted as an invasion of privacy or threat, and result in distress, agitation or aggression directed towards the person assisting [10-13]. Core activity limitations, including the inability to independently manage toileting, are a primary reason for entry into community or residential age care systems [14-16].

Assisting a person dependent in toileting, or after an episode of incontinence is an essential task for carers, undertaken numerous times each day. Regardless of the willingness
of family and professional carers to assist, toileting and associated cleaning is frequently perceived as physically and emotionally demanding [8]. For care staff, clean-up of human waste has been associated with low occupational status and a reduction in staffs’ personal sense of self-worth [17].

In recent years there have been multiple calls for greater dignity in the care of dependent people, particularly older dependent people [18, 19]. In western cultures, dignity is a widely accepted concept, but has proved difficult to define [20]. In an attempt to conflate diverse concepts of dignity in long-term care for older people, Nordenfelt and Edgar [21] proposed four key variants which are used in ethical debate: Dignity that is intrinsic or innate to the state of being human, dignity that is bestowed through status in society, dignity related to one’s moral stature, and dignity of individual identity. In contrast, a report concerning dignity in care settings, the UK Royal College of Nursing proposed a dynamic definition of dignity relating to the delivery of nursing and care services. This definition incorporates places where care is carried out, including the physical environment and organisational culture, the processes undertaken in delivering care, and interpersonal or relational aspects of attitudes, behaviours and communication that occur during care delivery [22]. More commonly authors have chosen to elucidate the term through articulating examples of clear violations of dignity [23, 24]. Particularly in health and care contexts, violation of dignity is repeatedly reported by older people relating to issues of access to, and lack of privacy and invasion of personal space during intimate personal care, including toileting [19, 25].

Enhancing the dignity of older people has become a key health policy direction in the UK [18] and societies for the promotion of dignity in health and care settings have been established in Australia and internationally (for example, see Dignity in Care Australia http://www.dignityincare.com.au ). Toileting and management of incontinence have been a

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particular focus of dignity campaigns, such as the ‘Behind Closed Doors’ campaign in the UK [19] and the Dignity in Continence Care Framework in Australia [26, 27] which emphasise the need for knowledgeable continence care strategies and empathic interpersonal communication as key elements to reinforce the dignity of the care recipient. Despite these campaigns, a number of authors have recognised that developing practical guidance to operationalise dignity in care is problematic. The term itself is highly variable in its interpretation, and there appear to be few concrete procedures to guide everyday care that preserves an older person’s dignity, especially when that care is invasive of one’s personal space, such as cleaning after voiding [18, 28].

A concept closely related to dignity is autonomy, commonly defined as the ability to make and act on one’s own decisions [29, 30]. For very dependent older people in care settings, exercising autonomy over when and how intimate care of one’s body is carried out is difficult. Some authors argue that autonomy is only able to be exercised if an individual has higher order cognitive capacity to make informed decisions and/or the physical capacity to act on a decision. Others consider that autonomy with reference to personal care is impossible for very dependent older people [13]. This however tends to disregard the potential that some assistive technologies may have to empower people with disability. For example, the electronic toilet-seat bidet provides automated post voiding cleaning. Using this assistive technology may improve a dependent person’s sense of autonomy and reduce or eliminate the need to have another person invade one’s personal space to wipe, thus improving the dignity of the toileting experience.

This bidet, sometimes colloquially known as the ‘Japanese toilet’, is currently commercially marketed as an improvement in post voiding hygiene and an aid to daily living for people living with disability. (For example, see www.thebidetshop.com.au). Replacing the

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usual toilet seat, the bidet provides an alternative to manual post voiding cleaning with two, retractable, self-cleaning nozzles that deliver pressure, width- and temperature-controlled sprays of water for perineal and peri-anal cleaning. A warm air blower dries the user after cleaning. The bidet may be operated by the user or by a carer via remote control, inside or outside the toilet room.

Despite the core nature of toileting and its potential impact on physical and emotional outcomes, there is a paucity of empirical research that explores how dependent older people and their carers manage the task of post voiding cleaning, how it could be improved, and the role nascent technologies may have on the performance of this very personal activity. To date, there is only one experimental study in the literature that examines the use of the bidet in an aged care environment [31]. This study investigated toileting care in dependent nursing home residents. Twenty-seven staff toileted 14 residents using an electronic bidet and 8 residents using usual manual post voiding (wiping) care. Findings were that there was overall improvement in the toileting experience for about half of the bidet group and staff. As well, there was a reported reduction in bacterial loads in the urine of participants in the bidet group compared to usual care controls.

Since this 2005 study, electronic bidet technology has improved. There is evidence that occupational therapists and other health professionals are increasingly recommending bidets to enhance the independence and dignity of a range of clients with disabilities [32-38]. The electronic bidet has been added to the catalogue of aids to daily living provided by the Australian Government Department of Veterans Affairs to eligible veterans, and is an eligible home modification under the National Disability Insurance Scheme, if assessors can demonstrate the bidet improves clients’ functional capacity and decreases the need for additional funded supports, such as personal care services [39]. Despite this, the literature has remained
sparse on the potential for such technology to provide greater function and dignity for dependent older people and those who provide support. It is not known whether the bidet would be acceptable as post voiding cleaning to the wide variety of individuals living in Australian aged care services; if the bidet has capacity to adequately clean and dry, given variations in type of void, anatomy, size and shape of individual users; and whether the bidet may be acceptable and clinically useful for staff of Australian aged care homes.

1.1 Research aims and objectives

The aim of this work is to address this gap in knowledge by investigating the potential of the electronic bidet to support older people with core self-care activity limitations in toileting, as well as family and staff who provide support for older persons’ daily intimate personal care needs.

The purpose of this body of work is to determine if the bidet is feasible, acceptable, practical and an effective alternative to usual, manual post voiding cleaning, for older people, family and professional carers in aged care contexts.

The specific research objectives are to:

1. Investigate the factors, including the attitudes, values and practical aspects that influence the acceptance of the bidet by older people, family carers, and staff of residential aged care.

2. Establish the feasibility of installing and using bidets in the day-to-day care of older Australians in residential aged care homes.

3. Develop and pilot a range of measures of acceptance, effectiveness and utility of the bidet.

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4. Determine staff acceptance of the bidet and its effect on work patterns and practices when introduced in residential aged care.

5. Determine the limitations of the bidet and record any contra-indications.

6. Compare bacterial levels in the urine of residents of Australian aged care homes in bidet and usual care conditions, and

7. Monitor cost of incontinence products pre- and post-installation of bidets in residential aged care homes.

1.2 Research approach and methodology

The nature of investigating a new technology with older dependent people, family and professional carers who are living and working in a variety of contexts is complex. A singular approach using quantitative methods may answer the aims of how acceptable or how effective the bidet is but will provide limited understanding of the variables that may have influenced those outcomes. These may include attributes, expectations and experiences of the individuals involved, and the setting, which could be explored using qualitative methods. Therefore, a mixed-methods approach is proposed. This methodological approach combining quantitative and qualitative methods emerged over the second half of the 20th century [40-42]. Exponents justified the combination of methods, stating that a richer understanding of phenomena is gained through utilising qualitative methods as exploratory or explanatory techniques, and quantitative methods to count and experimentally manipulate variables. Combining these two approaches allowed researchers to draw on the strengths of each method to reach conclusions that would not be possible using one method alone [41, 43]. Critics of this approach, such as Guba and Lincoln [44], identified the incompatibility of the underlying epistemologies. They stated ‘mixed methods’ failed to provide a scientifically coherent justification for the conflation
of quantitative and qualitative methods. The following explores the philosophical underpinnings of mixed methods in order to present a justification for its use in this work.

1.3 A critical realist paradigm to support a mixed methods approach

The assumptions, concepts and propositions that orient researchers’ thinking and guide investigation comprise a theoretical paradigm or ontology that underpins the researcher’s stance on the nature of reality [45]. How we come to know and justify those assumptions, concepts and propositions about reality is known as epistemology, from the Greek *epistêmê* ‘to know’ [46]. Epistemology demands consideration of questions such as ‘how do we know what we know?’, ‘how do we go about justifying what we know?’, ‘what is worth knowing?’ and ‘what is the relationship between the would-be-knower and what can be known?’ [44, p.108., 46]. Epistemology is driven by the nature of the underlying ontology and in turn, drives the methodology of investigations. Methodology comprises the methods and analytical processes that are used to articulate epistemological questions [45, 47]. Epistemology thus provides a lens ‘for viewing the world’ [48, p.3.]

Over the 20th Century there have been two dominant and contrasting epistemological approaches. The positivist paradigm is based in an ontology that espouses an objective reality, capable of being experimentally manipulated and independently observed in order to test hypotheses. Positivism has largely been associated with quantitative methods, where knowledge is gained through observation and measurement of phenomena. In contrast, the constructivist paradigm posits that reality is based on meanings attached to phenomena, which are subject to change over time and with differing context. Constructionism is primarily associated with qualitative inquiry where researchers seek to build understanding and make meaning of the multiple, individual realities of those who experience the phenomena [45].
The epistemological incompatibilities of the positivist/constructionist paradigms have been addressed over the latter half of the 20th Century through the development of a number of philosophical positions, including Critical Realism [42]. This approach gives coherence to the conflation of quantitative and qualitative methods within a single investigation [48]. Critical realism proposes that there is a discoverable reality, or ‘truth’ as sought by researchers, however reality is nested within three domains, each with specific characteristics [49]. Error! Reference source not found. provides a schematic of the relationship of the domains.

![Figure 1.1 The three nested domains of reality within a critical realist approach Adapted from Mingers [50].](image)

The domain of the Real comprises basic mechanisms that generate events. In general, these mechanisms are not directly observable, but cause or shape events in the domain of the Actual. As examples, gravity is a force that is not able to be directly observed but is a mechanism that generates certain events such as the attraction of astronomical bodies; or in the psycho-social realm, human values are mechanisms that generate certain behavioural responses in people. The domain of the Empirical comprises those experiences or events which the researcher will observe through a variety of methods [48, 49, 51]. For example, the observable experience of gravity for a researcher may be the observation of the orbit of planets around stars; or the observable expression of human values it may be consumer choices between more
expensive fair-trade goods versus a cheaper alternative. The observed event, in the domain of the Empirical is distinguished from its causal mechanisms and highlights that any scientific inquiry may be fallible, for the reason that only part of reality can be observed [47].

A Critical Realist epistemology emphasises the reciprocity of relationships between the observable experience, the actual events and causal mechanisms. Consequently, Critical Realism focusses not only on observed phenomena, but also on explanatory aspects that underlie observed phenomena. Critical Realism has been criticised as diminishing the predictive power of observable events and thus curtailing the development of theory due to its explanatory focus on the ‘how’ and ‘why’ of observed phenomena [51]. However Wainwright [52] states that in order to understand the domain of the ‘Real’, theory must be generated and tested through observable events. A Critical Realist epistemology can be applied to both social and natural sciences, but the methods of data collection and analysis vary according to the nature of the phenomena under study and include both quantitative and qualitative methods appropriate to the research question [53].

1.4 Research design

The mixed methods research design used in this thesis is conceived in three broad phases. Each phase is intended to inform the development of the subsequent phase, as outlined in Figure 1.2.
Phase 1 comprises two concurrent exploratory activities, commencing with a scoping review of the bidet literature, presented in Chapter 2. A scoping review methodology was selected as a preliminary step to understand what is currently known about the bidet and its use, given limited empirical evidence.

Figure 1.2: Conceptual flowchart of the study design phases.
Secondly, a series of qualitative in-depth interviews with family carers who have experience of using a bidet with an older dependent family member were undertaken (Chapter 3). Carers’ opinions and practical experiences of using a bidet were examined to develop a better understanding of the factors that may influence the acceptance or rejection of this technology by the various stakeholders; the ability of the bidet to clean and dry the user; and the physical and psychological effects it had on the carer, or care relationship. Also investigated were techniques carers had developed to effectively use the bidet with the dependent person, as well as any issues that arose during its use. Practical matters around installation, operation and maintenance were also explored.

These two activities formed the initial exploratory stage of this research as well as a process of due diligence to assess risk of potential harm or benefit of the bidet prior to progressing the study. They also provided an initial framework for the topic areas to be investigated in phase 2.

The second phase comprised a single arm, mixed methods, feasibility study, presented in Chapter 4. This study was conducted in a dementia-specific residential age care home (ACH) and investigated practical issues of installation, operation and use of the bidet in this setting. A range of quantitative measures were developed and piloted. These assessed resident acceptance and reactions to the bidet, as well as objectively recording the ability of the bidet to adequately cleanse and dry the user, the time taken in toileting activities compared to usual care routines, and changes in use and cost of incontinence products for the ACH over the study period. Qualitative focus groups and interviews were undertaken with staff at the end of the 12-week intervention and the results synthesised using an analytical framework of triangulation to further explore and explain relationship between the two data sets [54].
Phase 3 (Chapter 5) builds from the feasibility study in phase 2. A pragmatic, mixed-methods, controlled, pilot study was conducted in two Australian residential ACHs. The measurement tools, developed and piloted in phase 2, were refined and used along with additional measures of bacterial loads in resident participants’ urine, odour associated with incontinence and staff workload. Where appropriate, comparisons were made between intervention and usual care groups. The same sequential approach to data gathering was employed with qualitative data being used to expand and explain quantitative results.

The final chapter of this thesis summarises this work, discusses the potential of the electronic bidet to improve the toileting experience for older dependent people and carers in aged care settings using a multi-dimensional framework of clinical utility [55], expands a conceptual model of uptake and use of assistive technologies by older people [56] and proposes considerations for methods in future research of bidet use with older, dependent people.

Chapter 3 and 4 are formatted in their final version for submission to the Journal of Enabling Technologies. Chapter 2 is presented in the format for submission to the journal Disability and Rehabilitation.
1.5 References


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Chapter 2  Literature Review

This chapter provides the background to the investigation of the clinical utility of the bidet in aged care through a scoping review of the literature. A scoping review provides a broad overview of literature, including ‘grey’ literature and this review was undertaken to establish what is known about the bidet and its use in any health- or care-related context. The review was inclusive of relevant literature from 1900- May 2017, and provides an overview of narrative publications and research undertaken with the bidet.

2.1 Introduction

Use of the toilet is a critical skill for independent living. The process of toileting is complex, consisting of mobilising to a toilet, undressing, positioning on the toilet, voiding bladder or bowels, wiping or other manner of cleaning, redressing and washing hands. Toileting is usually mastered in early childhood and control over this private activity remains integral to a person’s dignity throughout life. People with disability report being happy to receive assistance with undressing and redressing for toileting but will go to extraordinary lengths to avoid requiring assistance with wiping [1]. Increasingly, older people, legislative and regulatory authorities call for care for dependent people to be delivered with dignity, but the concept of dignity is poorly defined and difficult to operationalise when assistance with intimate care, such as toileting, is required [2].

Assisting older people with post voiding cleaning is stigmatising and associated with low occupational status. Staff in aged care settings are reported to be ostracised by others when they are associated with managing clean-up of human waste, and as a result develop coping mechanisms such as disassociating or distancing themselves from the task to manage this ‘dirty work’ [3]. In western cultures, clean-up is a manual task that is invasive of a dependent individual’s intimate personal space [1]. The process of cleaning usually involves manual
removal of any moisture or remaining solid waste with toilet paper, wet wipes or damp face washers, and where indicated, the use of a shower hose to wash the lower half of the body, followed by drying the skin and the application of barrier creams as required. For family and professional carers, cleaning after voiding is often associated with the need to physically assist a dependent person, requiring sustained awkward posturing and risk of musculoskeletal injury.

Care practices for post-voiding cleaning -that is the cleaning of the perineum and perianal area after urination or defecation- are rarely documented and from the author’s three decades of experience in aged care, do not appear to have varied over time.

Populations across the globe use two principle methods of post defecatory cleaning; wiping with tissue paper or washing with water. The method used for cleaning appears to be culturally influenced by such factors as the amount of dietary fibre consumed as part of traditional diets, (influencing the consistency of stool), the availability of paper or water, and religious beliefs. Before the advent of widespread indoor plumbing and heated water, climactic conditions may have also influenced the methods used. Once a method is adopted it appears to become a cultural norm [5]. In many English–speaking cultures, cleaning with paper tissue is the norm and water cleaning methods have been viewed with humour or suspicion [6, 7].

Any sanitary apparatus designed for the water washing of the perineum or perianal area is generally referred to as a ‘bidet’, however nomenclature varies regionally. For example, in the UK the bidet is more commonly known by the proprietary name ‘Clos-o-Mat’ [8]. While the definition of a bidet remains unclear, it has been recommended for over a century for a variety of clinical conditions or to compensate for disability. For example, a hand held bidet (Fig 2.1) was suggested for treatment of venereal disease and “the application of medicated lotions” in a 1909 edition of the UK medical journal ‘The Lancet’, [9] p.536.
Recent technological advances have supported production of an electronic toilet-seat replacement bidet. These units have a variety of features including a thermostatically controlled heated seat and two, retractable self-cleaning nozzles delivering pressure, width and temperature controlled streams of water for front and rear cleaning, and warm air drier. An example is presented at Figure 2.

The electronic toilet top bidet has received broad acceptance in Asian and middle eastern countries over the last two decades. Installation of bidets in Japanese households is reported to have increased from 60% in 2009 to over 74% in 2014 [10, 11]. Current advertising material from retailers of modern electronic bidets promote the use of the bidet to compensate
for various functional limitations affecting toileting, such as back pain, management of dermatological conditions of the perineum, or as useful for the prevention of infections, including urinary tract infection (for examples, see www.thebidetshop.com).

Bidet technology will continue to advance and commercial suppliers will continue to promote bidet products to address a variety of health and disability issues. Anecdotal reports from occupational therapists have supported the use of bidets for people with disability [12-14]. However, no synthesis of extant literature has been conducted, nor has the utility or safety of the bidet been systematically explored, nor have either indications or contraindications for use been established.

Scoping reviews are a useful initial step in surveying the research landscape and identifying key concepts where there is limited research or lack of definitional clarity [15, 16]. Scoping reviews ask a broad question, encompass literature that utilise a wide range of study methodologies, including grey literature, and do not attempt meta-analysis [16, 17]. Scoping reviews have been described as providing a ‘panoramic overview’ of the extent and context of a field of research, with potential to influence practice, policy or further research. [18](p. 1388). The aim of this scoping review is to determine the nature and extent of use of the bidet as well as associated indications or contraindications for use.

2.2 Method

The approach for this scoping review utilises a five stage framework outlined by Arksey and O'Malley [19]. The framework is intended to provide a rigorous, transparent and replicable approach to the review. The five stages are (i) identifying the research question; (ii) identifying relevant studies; (iii) study selection; (iv) charting data; and (v) collating, summarising and reporting results.
2.2.1 Identifying the research question

The research question is ‘what is known about the bidet in any health- or care-related application?’ The research question is designed to be broad in conceptual and contextual scope. The concept ‘health- or care-related application’ is intended to cover use of the bidet for prevention or treatment of any condition, as an aid to daily living for individuals, or as assistance for family or professional carers. The context is likewise broad, and intended to capture literature relating to any healthcare setting, geographical location or socio-cultural demographic.

The objectives of the review are to characterise:

- Populations and context of use;
- Publication types and methodologies;
- Reported outcomes, including any adverse events, associated with bidet use.

2.2.2 Identifying relevant studies

This scoping review will seek to identify available literature of any type, including ‘grey' literature, relating to the bidet.

Six electronic databases were searched for relevant publications: Medline, Citations in Nursing and Allied Health Literature (CINAHL), Scopus, Web of Science, The Cochrane Collection and Ovid. Limits were set for dates from 1900-present and to articles in English, including English abstracts of articles in other languages. Search terms were: bidet; bidet OR toilet AND -incontinence; -incontinence management; -continence; -assistive technology; -toilet*; -dementia; -Alzheimer*; -aged care; -nursing home; -long-term care; -disability. An initial search was conducted in February 2015 and repeated in May 2017. An automated alert was set up with Ovid Medline to scan each month for new articles meeting search criteria that
were added to this database. Reference lists of retrieved articles were manually searched to identify further relevant references. Grey literature, defined as information produced by all levels of government, academics, business and industry in electronic and print formats, that is not controlled by commercial publishing (www.greynet.org) was searched using MedNar (www.mednar.com) and Google, applying the search terms; bidet and -nursing home, -disability, - incontinence. Wikipedia and websites of The Continence Foundation of Australia, the International Continence Society and World Toilet were manually searched for references to bidets.

All citations were imported in to EndNote X8 (Clarivate Analytics) bibliographic reference software.

2.2.3 Study Selection

Two reviewers (MG, LC) screened and selected records using the PRISMA protocol for systematic reviews [20] as a model. Results are presented at Figure 2.3. For academic database searches, duplicates were removed followed by screening of abstracts or full-text of articles without abstract for relevance. For Google and Mednar searches, the first 20 pages or 200 hits, (or total number of hits if under 20 pages), were scanned for relevance. Advertising and personal opinion pieces, such as testimonials from a non-clinical source, were excluded. Duplicates were removed. Criteria for inclusion from all sources was that the abstract or full article was in English and directly related to the application, use or investigation of any type of bidet, with any population in any health or care context. Records that primarily involved manufacturing or marketing of bidets, toileting interventions or reviews of products related to toileting that did not involve bidets, adverse events involving toilets only and grey literature that was primarily advertising, an ‘advertorial’ or personal, non-clinical, opinion of bidet use, were excluded.

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2.2.4 Charting data

A descriptive analytic process was used to extract contextual, process and outcome information from each article [21].

2.2.5 Collating, summarising and reporting results

Following tabulation, frequencies and percentages were used to give a descriptive numerical summary of characteristics of publications. Publications were then categorised by two reviewers (MG, LC). First, publications were ranked by study design using the Joanna Briggs Institute (JBI) Levels of Evidence hierarchy [16]. Second, each publication was rated for quality, based on a variety of criteria including; adequacy of reporting, sampling techniques, validity and reliability of measures used, appropriateness of analysis methods, risk of bias and coherence of analytic processes used in opinion and text publications, using the JBI suite of Critical Appraisal Tools appropriate for each publication type [22]. No meta-analysis was undertaken. Reports of nosocomial (hospital acquired infectious) outbreaks were assessed against the 22 item Outbreak Reports and Intervention studies Of Nosocomial infection (ORION) reporting criteria [23]. The ORION statement supports standardised reporting for all nosocomial outbreaks to encourage transparency of reporting and promote ease of comparison between reports to better understand dynamics of infection, including transmission, success of interventions and prevention. Results were synthesised and reported using a framework developed from the ORION statement [24].

Qualitative content analysis was undertaken to outline themes that arose from the literature. Guiding both these processes, summative content analysis was used to review articles. Summative content analysis is a two-step process, first identifying and grouping key words or contexts to explore the subject using frequencies and percentages, and secondly

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developing concepts about the topic that provide a way of summarising disparate information from a variety of peer-reviewed and grey literature sources [25].

2.3 Results

A total of 815 records were located. The flow of records from citation identification to inclusion is at Figure 2.3. One-hundred and forty-nine (149) records remained after elimination of duplicates and irrelevant grey literature records. Abstracts, or full-text for articles without abstract were reviewed for relevance. One hundred and six (106) records were excluded at this step, including fifteen that could not be sourced despite searches of institutional libraries holdings and efforts to locate the source journal, magazine or publisher. The most common reasons for non-availability appeared to be lack of digitisation of back issues of magazines (e.g. [26, 27]) or the citation being from unpublished conference proceedings (e.g. [28, 29]). Forty-three full text records were then read in detail and a further 4 excluded; one was a humorous article [7], two reported only on the use of the sitz bath (a shallow basin designed for soaking the perineum or perianal area for a variety of post-surgical or perineal or perianal conditions) [30, 31], and 1 reported only on environmental cleaning procedures for the bidet [32]. Thirty-nine articles were included in the final review.
2.3.1 Descriptive numerical summaries

*General characteristics of included studies*

Error! Reference source not found. provides an alphabetically tabulated summary of general characteristics of the included studies, detailing: Year of publication, country of origin, journal, study design, aims, participants and setting, bidet type (if reported) and main outcomes.

Error! Reference source not found. summarises year of publication by decade from 1900, country and foci of publications. The majority of the 39 included articles that were published from 2000 (26/39, 66.5%) and nearly half (17/39, 43.5%) were published after 2010. Articles (or included abstracts in English) came from 11 countries with Japan (10/39, 25.6%) and the UK (9/39, 23.0%) representing almost half of all publications. The focus of the majority
of articles concerned a field of medicine or medical science (23/39, 59.0%) and rehabilitation (10/39, 25.5%).

Most articles (30/39, 76.9%) did not report or specify the type, make nor model of bidet. Of those that did, 6/39 (15.4%) reported on an electronic bidet and the remaining 3 articles reported on different types of manually operated bidets.
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year of publication</th>
<th>Country</th>
<th>Publication</th>
<th>Study design/publication type</th>
<th>Aim</th>
<th>Participants &amp; setting</th>
<th>Bidet type</th>
<th>Main outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anon.</td>
<td>1958</td>
<td>UK</td>
<td>British Medical Journal</td>
<td>Questions and comments section.</td>
<td>Response to enquiry about the use of bidets for personal cleanliness. Determine association between bidet use, pre-term birth and bacterial vaginosis in pregnant women.</td>
<td>NA</td>
<td>Unspecified</td>
<td>Bidets are recommended for personal cleanliness.</td>
</tr>
<tr>
<td>Asakura et al.</td>
<td>2013</td>
<td>Japan</td>
<td>Obstetrics and Gynecology</td>
<td>Retrospective cohort study</td>
<td>1,293 survey respondents with complete microbiology records at a Japanese university obstetric unit.</td>
<td>Unspecified</td>
<td></td>
<td>No association between bidet use and risk of pre-term birth or bacterial vaginosis in pregnant women</td>
</tr>
<tr>
<td>Basso</td>
<td>2006</td>
<td>Italy</td>
<td>Diseases of the Colon and Rectum</td>
<td>Single expert opinion; professional communication</td>
<td>Describe the bidet and present it as</td>
<td>NA</td>
<td>NA</td>
<td>Advocates judicious use of bidet for hygiene and managing a number of anal conditions.</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year of publication</td>
<td>Country</td>
<td>Publication</td>
<td>Study design/publication type</td>
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<td>Participants &amp; setting</td>
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<td>Main outcomes</td>
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<tr>
<td>Beresford</td>
<td>1997</td>
<td>UK</td>
<td>British Journal of Therapy and Rehabilitation</td>
<td>Single expert opinion</td>
<td>Review product</td>
<td>NA</td>
<td>Unspecified</td>
<td>Recommended as solution for independent toileting for people with moderate to severe disability.</td>
</tr>
<tr>
<td>Beresford</td>
<td>1999</td>
<td>UK</td>
<td>British Journal of Therapy and Rehabilitation</td>
<td>Single expert opinion</td>
<td>Review product</td>
<td>NA</td>
<td>Clos-o-mat shower toilet. Total Hygiene, UK.</td>
<td>Recommended for people with disability who are unable to clean after voiding.</td>
</tr>
<tr>
<td>Burkitt et al.</td>
<td>1996</td>
<td>UK</td>
<td>Medical Engineering and Physics</td>
<td>Observational, descriptive report</td>
<td>Describe collaborative process of development of portable bidet for people with disability associated with motor neurone disease (MND) Description of a range of technologies, including bidet, to assist older people</td>
<td>500 survey responses and 30 interviews with people with MND residing in the community in the UK</td>
<td>Unique portable design</td>
<td>12 portable bidets designed, built and trialled. Successfully met specifications of people with severe physical functional limitations.</td>
</tr>
<tr>
<td>Cameron and Doughty</td>
<td>2010</td>
<td>UK</td>
<td>Journal of Assistive Technologies</td>
<td>Narrative review; opinion paper</td>
<td>NA</td>
<td>Unspecified</td>
<td></td>
<td>Bidet proposed as useful assistance for older people with disability.</td>
</tr>
<tr>
<td>Claesson and Claesson</td>
<td>1985</td>
<td>Sweden</td>
<td>Journal of Hospital Infection</td>
<td>Non-interventional; Retrospective report of clinical investigation</td>
<td>Investigation of source of outbreak of Maternity unit in Sweden</td>
<td>Unspecified</td>
<td>'handshower-head' used for Pathogen colonised hand shower head and toilet seat.</td>
<td>New procedure for sterilising handshower head before each</td>
</tr>
</tbody>
</table>

1 The sitz bath is a shallow basin designed for soaking the perineum or perianal area for a variety of genito-anal conditions, including post-operative pain.
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year of publication</th>
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<th>Publication</th>
<th>Study design/publication type</th>
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<th>Bidet type</th>
<th>Main outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohen</td>
<td>2008</td>
<td>USA</td>
<td>The Interdisciplinary Journal of Rehabilitation</td>
<td>Expert opinion</td>
<td>Describe new toileting and bathing equipment Feasibility and effect of using electronic wash-and-dry bidet for residents and staff</td>
<td>22 permanent residents and 27 nursing assistants of a not-for-profit US nursing home</td>
<td>Electronic toilet-top bidet Luscence Luxury Lavage INAX Corp. Japan</td>
<td>Bidets recommended for independent cleaning after voiding. No further outbreak reported over 12-month follow up.</td>
</tr>
<tr>
<td>Cohen-Mansfield and Biddison</td>
<td>2005</td>
<td>USA</td>
<td>The Gerontologist</td>
<td>Quasi experimental, before and after prospective controlled study</td>
<td>Describe uses of bidet in response to reader question</td>
<td></td>
<td></td>
<td>Bidet demonstrated potential for improved comfort and hygiene of residents. Unexplained decrease of bacterial colony counts in urine of intervention group and increase in controls</td>
</tr>
<tr>
<td>Drife</td>
<td>1988</td>
<td>UK</td>
<td>British Medical Journal</td>
<td>Response to question</td>
<td>Describe uses of bidet in response to reader question</td>
<td>NA</td>
<td>Unspecified</td>
<td>Provides commentary on bidet use for pruritis ani and postnatal care of perineum</td>
</tr>
<tr>
<td>Garg</td>
<td>2010</td>
<td>India</td>
<td>Colorectal Disease</td>
<td>Non-interventional; post hoc multiple case report</td>
<td>Describe anterior anal fissure and postulates bidet as causal</td>
<td>10 patients of a colorectal clinic</td>
<td>Unspecified bidet-toilet</td>
<td>Water stream from bidet-toilet suspected of being a causal factor of anal fissure; 9 of 10 patients improved with cessation of bidet use and conservative treatment.</td>
</tr>
<tr>
<td>Garg and Singh</td>
<td>2017</td>
<td>India</td>
<td>Annals of Colorectal Research</td>
<td>Controlled case series</td>
<td>Determine if bidet usage increases incidence of anal fissure</td>
<td>165 adults consecutively presenting to colorectal specialist clinic for treatment of anal fissure</td>
<td>Unspecified single water stream bidet</td>
<td>Use of single water stream bidet use was associated with increased risk of anterior anal fissure Single sharp water stream bidets considered as hazardous Method of cleaning (tissue paper or water wash) attributed to historical, climactic and dietary factors of peoples around the world.</td>
</tr>
<tr>
<td>Garg and Singh</td>
<td>2016</td>
<td>India</td>
<td>Diseases of the Colon and Rectum</td>
<td>Narrative review; opinion paper</td>
<td>Review post defecation cleaning methods</td>
<td>NA</td>
<td>Unspecified</td>
<td>Method of cleaning (tissue paper or water wash) attributed to historical, climactic and dietary factors of peoples around the world.</td>
</tr>
<tr>
<td>Gibson and Sinanan</td>
<td>1963</td>
<td>Ireland</td>
<td>Journal of Obstetrics and Gynaecology of the British Commonwealth</td>
<td>Non-interventional; Report of prospective clinical investigation</td>
<td>Determine risk of cross infection from bidets in a</td>
<td>30 patients of an Irish maternity hospital</td>
<td>Unspecified free-standing bidet with</td>
<td>No evidence of risk of cross contamination from bidet found; no significant changes</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year of publication</td>
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</tr>
<tr>
<td>Gordon et al.</td>
<td>1994</td>
<td>Ireland</td>
<td>British Journal of Obstetrics and Gynaecology</td>
<td>Non-interventional; Retrospective report of clinical investigation</td>
<td>Investigation of source of outbreak of haemolytic streptococcus</td>
<td>Shared toilet facilities of a maternity ward of Irish hospital</td>
<td>Spray nozzle in base of unit</td>
<td>Pathogen isolated to shower rose of freestanding bidet. New cleaning regime commenced. No streptococcus isolated on bidet on 4 subsequent tests</td>
</tr>
<tr>
<td>Gresham</td>
<td>2016</td>
<td>Australia</td>
<td>Australian Journal of Dementia Care</td>
<td>Product review</td>
<td>Describe compatible mobile shower commune chair and bidet</td>
<td>NA</td>
<td>Specific models of bidets can be used successfully with specific type of mobile shower commune chairs.</td>
<td></td>
</tr>
<tr>
<td>Haynes et al.</td>
<td>1987</td>
<td>UK</td>
<td>Journal of Hospital Infection</td>
<td>Non-interventional; Retrospective report of clinical investigation</td>
<td>Investigation of source of outbreak of haemolytic streptococcus</td>
<td>Shared toilet facilities of two UK post-natal units</td>
<td>Coway BA13 Woongjin Coway Corp. Korea</td>
<td>Pathogen isolated to bidet spray nozzle, toilet bowl and hand basin tap. Outbreak ceased after disinfection of bidet nozzle and bathroom surfaces.</td>
</tr>
<tr>
<td>Hongoh et al.</td>
<td>2016</td>
<td>Japan</td>
<td>Hinyokika Kiyo, Acta Urologica Japonica</td>
<td>Survey (abstract only in English)</td>
<td>Investigate incidence and purpose of using bidet for Japanese women</td>
<td>305 women attending Japanese urology outpatient clinic</td>
<td>Unspecified</td>
<td>Bidet used by 79% of sample. 41% of respondents used bidet to induce defecation. Concern this use is contrary to manufacturers expectations of use.</td>
</tr>
<tr>
<td>Hsu et al.</td>
<td>2009</td>
<td>China</td>
<td>Journal of Gastrointestinal Surgery</td>
<td>Pseudo - randomised controlled trial</td>
<td>Compare effects of warm water spray (bidet analogue) and ‘sitz bath’ for pain, irritation, hygiene, convenience</td>
<td>Alternately</td>
<td>Unspecified</td>
<td>No difference between groups found for post-operative pain, irritation, hygiene or wound healing. Spray was rated more convenient and patients more satisfied overall. Concluded warm water spray provided a safe and reliable alternative to sitz bath</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year of publication</td>
<td>Country</td>
<td>Publication</td>
<td>Study design/publication type</td>
<td>Aim</td>
<td>Participants &amp; setting</td>
<td>Bidet type</td>
<td>Main outcomes</td>
</tr>
<tr>
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</tr>
<tr>
<td>Iyo et al.</td>
<td>2016</td>
<td>Japan</td>
<td>Journal of Water and Health</td>
<td>Survey</td>
<td>Measure residual chlorine levels and microbial indicators in spray water of bidets with warm water storage tanks. Communicate occupational therapist experience of bidet use with clients with ALS.</td>
<td>127 warm water toilet seat bidets in a Japanese university research unit and hospital outpatient clinic.</td>
<td>Unspecified bidets with warm water tank storage and retractable self-cleaning nozzles.</td>
<td>Number of bacteria in bidet water spray was greater and residual chlorine levels were lower than tap water control. Bacterial levels low, indicating hygienic safety is maintained for general use. There may be risk of infection for immunocompromised people.</td>
</tr>
<tr>
<td>Jenkins</td>
<td>2012</td>
<td>USA</td>
<td>OT Practice</td>
<td>Professional news item</td>
<td>Communicate occupational therapist experience of bidet use with clients with ALS.</td>
<td>Patients with amyotrophic lateral sclerosis (ALS).</td>
<td>NA</td>
<td>Bidet useful in improving dignity, privacy and independence in toileting for people with ALS.</td>
</tr>
<tr>
<td>Jones and Ryan</td>
<td>2006</td>
<td>Australia</td>
<td>Conference Proceedings of the Australian Rehabilitation and Assistive Technology Association, 2006</td>
<td>Case studies; Conference presentation transcript</td>
<td>Describe bidet use in community rehabilitation.</td>
<td>2 young people with cerebral palsy; 1 with arthrogryposis.</td>
<td>Unspecified electronic toilet top and portable bidets.</td>
<td>Bidets provide independence and dignity for people with disability. Reduce caregiving requirements for a range of toileting assistance needs.</td>
</tr>
<tr>
<td>Kiuchi et al.</td>
<td>2017</td>
<td>Japan</td>
<td>Preventive Medicine Reports</td>
<td>Prospective survey</td>
<td>Determine relationship between bidet use and haemorrhoids and urogenital infection.</td>
<td>Anonymous, prospective, web-based surveys, 1 year apart of 7637 Japanese adults.</td>
<td>Not specified</td>
<td>Haemorrhoids and urogenital infection, except bacterial vaginosis, did not appear to be causally related to bidet use. Incidence of bacterial vaginosis was low and requires more research to understand any relationship.</td>
</tr>
<tr>
<td>MacLean and Russell</td>
<td>2010</td>
<td>Australia</td>
<td>Australian Family Physician</td>
<td>Expert opinion</td>
<td>Discuss current assessment and management of pruritis ani.</td>
<td>NA</td>
<td>Not specified</td>
<td>Bidet is a useful adjunct in management of pruritis ani.</td>
</tr>
</tbody>
</table>

Meredith Gresham
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year of publication</th>
<th>Country</th>
<th>Publication</th>
<th>Study design/publication type</th>
<th>Aim</th>
<th>Participants &amp; setting</th>
<th>Bidet type</th>
<th>Main outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miura et al.</td>
<td>2003</td>
<td>Japan</td>
<td>Pediatrics International</td>
<td>Non-interventional; Single case report</td>
<td>Describe case of overuse of bidet Describe cases of acute cystitis post installation of 'high-tech toilet'</td>
<td>14-year-old Japanese boy 5 case reports of Japanese women 268 non-pregnant women of childbearing age presenting to gynaecology outpatient clinic in Japan with increased vaginal discharge</td>
<td>Unspecified</td>
<td>Overuse of bidet is a probably factor in developing rectal mucosal prolapse. Bidet use may provoke bladder infection due to the washing action of the bidet and proximity of the bladder to the anus in females</td>
</tr>
<tr>
<td>Miyoshi et al.</td>
<td>2003</td>
<td>Japan</td>
<td>Internal Medicine</td>
<td>Non-interventional; post hoc analysis of multiple case reports</td>
<td>Describe cases of acute cystitis post installation of ‘high-tech toilet’</td>
<td></td>
<td>Unspecified</td>
<td></td>
</tr>
<tr>
<td>Ogino et al.</td>
<td>2010</td>
<td>Japan</td>
<td>Journal of Obstetrics and Gynaecology Research</td>
<td>Retrospective cohort</td>
<td>Compare vaginal microflora in bidet users and non-users Describe bidet and its applications for an English-speaking population unfamiliar with its use Educative text on dermatological conditions, including genitocrural and natal cleft infections Investigate effects of various pressure, temperature</td>
<td></td>
<td>Unspecified</td>
<td>Consistent use of bidet associated with altered normal vaginal microflora. Suggested mechanisms being bidet washing depleting normal microflora and/or facilitating introduction of other organisms.</td>
</tr>
<tr>
<td>Pack</td>
<td>1959</td>
<td>USA</td>
<td>Diseases of the Colon and Rectum</td>
<td>Guest editorial</td>
<td></td>
<td></td>
<td>NA</td>
<td>Regular use of the bidet by western (US) population is recommended</td>
</tr>
<tr>
<td>Russell</td>
<td>1962</td>
<td>UK</td>
<td>British Medical Journal</td>
<td>Expert opinion</td>
<td></td>
<td></td>
<td>NA</td>
<td>Bidet recommended to reduce transmission of infection of the genito-rectal area.</td>
</tr>
<tr>
<td>Ryoo et al.</td>
<td>2011</td>
<td>Korea</td>
<td>Journal of Korean Medical Science</td>
<td>Uncontrolled observational study</td>
<td></td>
<td></td>
<td>Electronic toilet-top bidet BA09-A, Woongjin</td>
<td>Low or medium pressure, warm water and wide water stream significantly lowered resting anal sphincter pressure.</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year of publication</td>
<td>Country</td>
<td>Publication</td>
<td>Study design/publication type</td>
<td>Aim</td>
<td>Participants &amp; setting</td>
<td>Bidet type</td>
<td>Main outcomes</td>
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<tr>
<td>Ryoo et al.</td>
<td>2015</td>
<td>Korea</td>
<td>Techniques in Coloproctology</td>
<td>Controlled comparison</td>
<td>and width of water stream from bidet on ano-rectal resting pressure: Compare anal resting pressures in normal healthy persons during use of electronic bidet and conventional sitz baths.</td>
<td>40 medically screened, healthy adult volunteers</td>
<td>Coway Corp., Korea</td>
<td>Bidet may be useful adjunct in problematic defecation.</td>
</tr>
<tr>
<td>Sakurai et al.</td>
<td>1997</td>
<td>Japan</td>
<td>Japanese Journal of Urology</td>
<td>Non-interventional; Single case report (abstract only in English)</td>
<td>Describe effect of bidet water stream on voiding bladder</td>
<td>77-year-old male with poorly contractile bladder and decreased sensation requiring catheterisation to empty bladder</td>
<td>Hand-held pump bidet. Manufacturer not specified</td>
<td>Both bidet and sitzbath condition reduced anal resting pressures. There was no difference between conditions.</td>
</tr>
<tr>
<td>Sauer</td>
<td>2010</td>
<td>Australia</td>
<td>Australian Family Physician</td>
<td>Non-interventional; Professional communication</td>
<td>Describe opinion of the bidet in treatment of anal dermatitis: Describe peri-anal burn from hot water stream of bidet Report benefits of bidet for improved function and potential</td>
<td>NA</td>
<td>NA</td>
<td>Clinical experience of author indicates rapid response of this condition with consistent bidet use, additional treatment not required.</td>
</tr>
<tr>
<td>Shulman et al.</td>
<td>2001</td>
<td>Israel</td>
<td>Burns</td>
<td>Non-interventional; Single case report</td>
<td>69-year-old Israeli woman</td>
<td>Unspecified</td>
<td>Bidet water temperature may present a burns hazard</td>
<td></td>
</tr>
<tr>
<td>Span</td>
<td>2012</td>
<td>USA</td>
<td>New York Times</td>
<td>Expert opinion</td>
<td>NA</td>
<td>NA</td>
<td>Clinical opinion that the bidet may be effective for improved hygiene in older, especially frail or cognitively impaired adults</td>
<td></td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year of publication</td>
<td>Country</td>
<td>Publication</td>
<td>Study design/publication type</td>
<td>Aim</td>
<td>Participants &amp; setting</td>
<td>Bidet type</td>
<td>Main outcomes</td>
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<tr>
<td>Tsunoda et. al.</td>
<td>2016</td>
<td>Japan</td>
<td>Environmental Health and Preventative Medicine</td>
<td>Survey</td>
<td>Investigate use of bidet; explore correlates of bidet use and anal dermatitis</td>
<td>4,963 community dwelling Japanese over 14 years of age</td>
<td>Unspecified</td>
<td>83% had a bidet at home (unspecified type). Ownership associated with older age. 55% used bidet; use associated with being male and older. Bidet regarded by participants as stimulant for defecation. Correlates of anal dermatitis (cause unspecified) were male sex, younger age, washing before defecating, warmer water and frequency of faecal leakage.</td>
</tr>
<tr>
<td>Uchikawa et al.</td>
<td>2007</td>
<td>Japan</td>
<td>American Journal of Physical Medicine and Rehabilitation</td>
<td>Uncontrolled observational study</td>
<td>Test effectiveness of visually directed bidet water stream to stimulate bowel movement</td>
<td>20 inpatients of a Japanese spinal cord injury unit, at least 5 months post injury</td>
<td>Electronic toilet-top bidet (Panasonic DL-GT30)</td>
<td>75% success in producing a bowel motion irrespective of level of SCI. Reduction in time for bowel management in 11 of 13 patients. No complications reported</td>
</tr>
</tbody>
</table>
Table 2.2: General characteristics of included literature (n=39)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number (n=39)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Decade of Publication</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>1910</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1920</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1930</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1940</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1950</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>1960</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>1970</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1980</td>
<td>3</td>
<td>7.6</td>
</tr>
<tr>
<td>1990</td>
<td>5</td>
<td>12.8</td>
</tr>
<tr>
<td>2000</td>
<td>9</td>
<td>23.0</td>
</tr>
<tr>
<td>2010</td>
<td>17</td>
<td>43.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>39</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Country of origin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>10</td>
<td>25.6</td>
</tr>
<tr>
<td>UK</td>
<td>9</td>
<td>23.0</td>
</tr>
<tr>
<td>USA</td>
<td>5</td>
<td>12.8</td>
</tr>
<tr>
<td>Australia</td>
<td>4</td>
<td>10.2</td>
</tr>
<tr>
<td>India</td>
<td>3</td>
<td>7.7</td>
</tr>
<tr>
<td>Ireland</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>Korea</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>Italy</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>China</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>Israel</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>Sweden</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>39</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Publication foci</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine – urology</td>
<td>3</td>
<td>7.7</td>
</tr>
<tr>
<td>Medicine - colo-proctology</td>
<td>8</td>
<td>20.5</td>
</tr>
<tr>
<td>Medicine - obstetrics &amp; gynaecology</td>
<td>3</td>
<td>7.7</td>
</tr>
<tr>
<td>Medicine - prevention and general health</td>
<td>8</td>
<td>20.5</td>
</tr>
<tr>
<td>Medicine – burns</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>Rehabilitation – general</td>
<td>6</td>
<td>15.3</td>
</tr>
<tr>
<td>Rehabilitation – geriatric</td>
<td>4</td>
<td>10.2</td>
</tr>
<tr>
<td>Engineering - rehabilitation</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>Microbiology</td>
<td>3</td>
<td>7.7</td>
</tr>
<tr>
<td>Environmental sciences</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>39</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Methodological characteristics and quality of included studies

Ratings of levels of evidence and methodological effectiveness by study design and quality of reporting, was conducted for the 35 publications other than outbreak reports using the suite of critical appraisal tools developed by the Joanna Briggs Institute (JBI) [33]. Results are presented at Table 2.3. The majority of articles (54.3%, 19/35) are text and opinion pieces,
with 17 of these 19 publications comprising a letter, a case study or report of clinical experience. The next largest group (25.7%, 9/35) employed observational or descriptive study designs, followed by 6 (17.1%) using case-controlled or cohort methods. Only two articles (5.7%, 2/35) were reports of bidets used in controlled experimental interventions; one being a pseudo-randomised controlled trial comparing bidet spray against the sitz bath for proctological post-operative care [34] and one quasi-experimental study that compared comfort, aspects of hygiene and staff perceptions of bidet against usual personal care for nursing home residents [35]. The remaining four reports (10.2%, 4/39) of microbiological investigations of cross contamination involving bidets and outcomes are considered in more detail in section 3.2.5 of this chapter.

Most publications were low-level evidence, with a JBI rating of level 2 or below. However, for these publications over 80% criteria were met in the relevant JBI Critical Appraisal Tool for addressing bias in analysis or reporting, the conduct of the study, or in the presentation of a professional communication.

The lowest critical appraisal ratings were for two professional communications published in 1909 and 1958 [9, 36]. The highest rated publication for level of evidence was a pseudo randomised controlled trial which however received a lower reporting quality score (61.5%), in part affected by the inability to blind participants to treatment allocation, where treatment is a self-administered assistive technology.

Table 2.3: Methodological hierarchy and rating of quality of publications (n=35)

<table>
<thead>
<tr>
<th>JBI1 Level of Evidence</th>
<th>Methodological effectiveness hierarchy</th>
<th>Number of publications n (%)</th>
<th>Percentage of met criteria 2 (range, if &gt;1 publication)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>1a. Systematic Review of RCTs</td>
<td>0</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>1b. Systematic Review of RCTs and other study designs</td>
<td>0</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>1c. RCT</td>
<td>0</td>
<td>--</td>
</tr>
</tbody>
</table>

Meredith Gresham
Populations and context of use of bidet

Thirty-six of the 39 included articles reported on bidet use within diverse populations. The individuals and populations described across studies vary in:

- age, from paediatrics to geriatrics, including one study investigating the effects of the bidet compared to usual care with nursing home residents [35];
- functional ability, from healthy adults to people with disability that limits or prevents independent clean up after voiding; and
- presenting conditions, including post-surgical coloproctological, obstetric and urological patients; people with dermatological conditions of the perineum and perianal areas; as well as members of the general public who responded to surveys.

Of the 22 articles that reported the context of bidet use, settings included:

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• Acute care or outpatient clinic (45.4%, 10/22);
• domestic (36.4%, 8/22);
• rehabilitation (4.5%, 1/22);
• nursing home (4.5%, 1/22) and
• laboratory (9.0%, 2/22).

2.3.2 Content Analyses

Summative qualitative analysis of the aims and main outcomes of full text data revealed five broad themes across the included studies:

The bidet as harm

Of the 36 articles that report on any aspect of bidet use, nine (9/36, 25.0%) describe actual harm or potential for adverse effect. Reports of actual harm associated with bidet use included 2 clinical case reports of people presenting to health services with anal fissure [37, 38]; one case of prolapsed rectal mucosa [39], and one case of peri-anal burn [40]. Three clinical outbreak investigations in hospitals identified a bidet as a mode of transmission of infection [41-43]. Other reports postulated that the bidet may be a causal factor in alteration of vaginal microflora or development of urinary tract infection in women, through the water spray of the bidet spreading *ecoli* bacteria normally found in the gut to the urethra [44, 45]. One prospective investigation of microbiological profiles of the warm water storage tanks of 127 bidets found less residual chlorine in the tank water compared to potable tap water and a small percentage (2%) of the water samples contained bacteria (*Pseudomonas aeruginosa*), which the authors cautioned should be taken in to account when “managing warm-water bidet toilet seats in hospitals in order to prevent opportunistic infections in intensive care units…. “ [46] p. 68).
The bidet as a benefit

From the same 36 articles, 12 (33.3%) supported a diverse range benefits of bidet use. Ten articles (27.7%) recommended the bidet as a useful adjunct for toileting assistance for people with disability or frailty [1, 8, 14, 35, 47-52]; Five articles (13.9%) proposed that water washing with a bidet was more convenient than other methods of cleaning the peri-anal area, for improved general hygiene, reducing potential for infection and post-surgical care [6, 9, 34, 36, 53]; Four articles (11.0%) recommended use of the bidet for treatment of anal dermatitis [54-57]; one article indicated that a bidet could help with problematic defecation, by reducing resting pressure of the anal sphincter muscle to make passing a bowel motion easier [58], and one case study reported that use of a bidet promoted spontaneous contraction of the bladder, promoting urination and ceasing the need for catheterisation to empty the bladder [59].

The bidet as an assistive healthcare technology for independence

Assistive health care technologies are items or equipment that are used to increase, maintain or improve functional capabilities of individuals with disabilities [60]. Nearly a third of the publications (12/39, 30.8%) characterised the bidet as an assistive healthcare technology, rather than a standard item of household sanitary ware. The bidet was recommended by healthcare professionals for people with a diverse range of impairment across the life span, from children [51] adolescents [48], adults [1, 8, 14, 49, 50] and geriatrics [35, 47, 52, 59, 61]. Three articles commented that the bidet reduces care requirements for family and professional carers, including reducing or ceasing the physical strain of stooping and twisting to clean a dependent person [8, 35, 48] and two articles explored other bidet compatible assistive equipment, such as mobile shower-commode chairs and seat modifications, catering for disabled or aged individuals’ requirements [8, 61].
The bidet as domestic sanitary ware

Four articles (4/39, 10.2%) described the domestic use of the bidet in Japanese populations, exploring reasons for use and potential associations with medical conditions. High rates of bidet ownership or use were reported in two surveys. One reported ownership rates of 83% with usage rates somewhat lower at 55% in a survey of 4,963 community dwelling Japanese [11]. In another Japanese survey of 305 women, the bidet was used regularly by 79% of the sample [62]. Both these surveys reported a frequent reason for use (other than post-voiding cleaning) was to aid defecation. Two studies prospectively investigated potential associations between increasing uptake of bidets in domestic settings in Japan and haemorrhoids, urogenital conditions and pre-term birth. No evidence for causal association between bidet use and any of these conditions was reported [63, 64].

The bidet as a source of cross-contamination in hospitals

Three retrospective reports [41-43] and one prospective study [65] of nosocomial (hospital acquired) infectious outbreaks investigated the potential of the bidet to be a vector for transmission of infection. Type of bidet was specified in only one of the reports. Each report was assessed against the 22-item ORION (Outbreak Reports and Intervention Studies of Nosocomial Infection) reporting criteria, developed for standardised reporting methods [23] and is presented at Table 2.4. Results were synthesised using the ORION statement as a framework for analysis [24] and are at Table 2.5. Each of the four studies under consideration were conducted decades before ORION criteria were developed however, overall quality of reporting is moderate to good with between 52.9% - 88.9% of relevant criteria addressed in the reports.
These three retrospective studies described investigations undertaken to isolate the origin of *streptococcus*, an infectious organism, and its mode of transmission. In each of the reports the ‘shower spray’ type faucet of the bidet was implicated as a vector. Examples of this type of bidet provided at Figures 2.4 and 2.5. In all cases, further transmission was prevented with appropriate cleaning regimes and in one case, issuing a shower spray attachment for personal use with the bidet while an inpatient. No further reports of outbreaks since 1994 were located in the literature, though cleaning guidelines for bidets in public health facilities in England, targeting prevention of streptococcus, were found [32].
Table 2.4: ORION checklist: items to include when reviewing an outbreak report (OR) or intervention study (IS) of a nosocomial organism.

<table>
<thead>
<tr>
<th>ORION Item Number</th>
<th>Description</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is paper described as an outbreak report (OR) or intervention study (IS)?</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Is design of IS described?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Is Intervention &amp; main outcomes described?</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Introduction</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are background and rationale for IS/OR explained?</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Is organism described as epidemic, endemic?</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Type of paper</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Is paper described as IS or OR?</td>
<td>Y (OR)</td>
</tr>
<tr>
<td></td>
<td>If OR, is number of outbreaks given?</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Dates</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Are start &amp; finish dates of IS or OR given?</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are objectives stated for OR? Are hypotheses stated for IS?</td>
<td>N</td>
</tr>
<tr>
<td><strong>Methods</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Is study design described? How?</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Is study described as retrospective, prospective or ambidirectional?</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Does it state if decision to report or intervene prompted by any outcome data or not?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Is it stated if study formally implemented or not, with predefined protocol &amp; endpoints?</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Is number patients admitted given?</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Is age &amp; length of stay given?</td>
<td>Y (age NA)</td>
</tr>
<tr>
<td></td>
<td>Are eligibility criteria for IS or case definitions for OR given?</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Is proportion inter/intra-hospital transfers or admissions from care homes given?**</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Are potential risk factors for acquisition organism given?***</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Setting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Is unit, ward or hospital (and its units) described?</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Are number of beds, presence and staffing of infection control team given?</td>
<td>N</td>
</tr>
<tr>
<td><strong>Interventions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Are phases defined by major change in specific infection control practice (with start &amp; stop dates)?</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Is a summary table given, with details of interventions, their delivery and timing given?</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Culturing &amp; Typing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Are details of culture media, antibiograms and/or typing given?</td>
<td>Y</td>
</tr>
<tr>
<td>ORION Item Number</td>
<td>Descriptor</td>
<td>Study</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>11</td>
<td>Infection-related outcomes</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Are details environmental sampling given?</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Are there clearly defined primary &amp; secondary outcomes?</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Are they given at regular time intervals?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Are there sufficient time points per phase? (see ORION author’s checklist)?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Are denominators given (e.g., admissions, discharges, bed days)?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Is all cause mortality given?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Is prevalence organism, or incidence of colonisation on admission at same time intervals?</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>In a short IS or OR is a chart used with duration patient stay &amp; dates detection of organism? (see author checklist)</td>
<td>Y</td>
</tr>
<tr>
<td>12</td>
<td>Economic outcomes</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Is this a formal economic study?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>If so, are outcomes defined? Are resources (for interventions) described? Are costs in basic units? Are assumptions stated?</td>
<td>NA</td>
</tr>
<tr>
<td>13</td>
<td>Potential Threats to internal validity</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Which potential confounders were considered, recorded or adjusted for? (e.g., length of stay, case mix, occupancy, staffing levels, hand-hygiene, antibiotic use, strain type, processing of isolates, seasonality). Are measures to avoid bias described? (e.g., blinding; standardisation outcome assessment/provision of care).</td>
<td>NA</td>
</tr>
<tr>
<td>14</td>
<td>Sample size Statistical methods</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Are power calculations given? (if appropriate)</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Are statistical methods to compare groups or phases described?</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Do these account for dependencies in outcome data?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Do they adjust where necessary for confounders?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Are methods for subgroup or adjusted analyses described? Are they planned or not (exploratory)?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Is statistical analysis of an OR appropriate/necessary?</td>
<td>NA</td>
</tr>
<tr>
<td>15</td>
<td>Statistical methods</td>
<td>NA</td>
</tr>
<tr>
<td>16</td>
<td>Results Recruitment</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Are the dates defining periods of recruitment &amp; follow up given?</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>(see ORION text)</td>
<td>N</td>
</tr>
<tr>
<td>17</td>
<td>Outcomes &amp; estimation</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Is there a flow diagram?</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Is the estimated effect size &amp; its precision given for main outcomes?</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Is there a graphical summary of outcomes (for dependent data and most time series)?</td>
<td>N</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>ORION Item Number</th>
<th>Descriptor</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancillary analyses</td>
<td>18</td>
<td>Are subgroup analyses reported?</td>
</tr>
<tr>
<td>Harms</td>
<td>19</td>
<td>Are these pre-specified in each group or phase?</td>
</tr>
<tr>
<td>Discussion</td>
<td>20</td>
<td>Are possible confounders adjusted for?</td>
</tr>
<tr>
<td>Interpretation</td>
<td></td>
<td>IS:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Are these pre-specified in each group or phase?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is evidence for/against hypotheses assessed?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Are plausible alternative explanations considered, including regression to mean &amp; reporting bias?</td>
</tr>
<tr>
<td>Generalisability</td>
<td>21</td>
<td>OR:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is clinical significance of observations considered?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Are explanatory hypotheses generated?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is there discussion of how results may generalise to different target populations or settings?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is feasibility of interventions considered?</td>
</tr>
<tr>
<td>Overall evidence</td>
<td>22</td>
<td>Are results interpreted in context of current evidence?</td>
</tr>
</tbody>
</table>

Sum (percentage) of relevant ORION criteria with one or more “yes” per criteria addressed in report. (Criteria indicated NA are not included in the denominator)

14/18 (77.8) 9/17 (52.9) 9/16 (56.2) 16/18 (88.95)

Key:
Y = criterion is present in report
N = criterion is relevant to report, but omitted
NA = indicates item not relevant and removed from score
* = if possible
** = if relevant
### Table 2.5: Synthesis of results from the Outbreak Reports and Intervention Studies of Nosocomial Infection (ORION) statement

<table>
<thead>
<tr>
<th>Manuscript section</th>
<th>Sub-section</th>
<th>ORION Item</th>
<th>Synthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title and Abstract</td>
<td>NA</td>
<td>1</td>
<td>Two articles did not have abstracts as they were not required for the publication [65, 66].</td>
</tr>
<tr>
<td>Introduction</td>
<td>Background</td>
<td>2</td>
<td>In all four articles the rationale for the report is clearly explained. The pathogen/s under study were described. All four reports describe the context of infection for the population (mothers immediately after giving birth) and potential outcomes if infected.</td>
</tr>
<tr>
<td></td>
<td>Type of paper</td>
<td>3</td>
<td>All three outbreak investigations are clearly reported as such. The single prospective investigation of risk associated with cross contamination is also clearly stated [65].</td>
</tr>
<tr>
<td></td>
<td>Dates</td>
<td>4</td>
<td>Dates of outbreak are provided in two reports [41, 43]. Length of time in days is provide in the third outbreak report [66]. Dates are not required for the prospective investigation [65].</td>
</tr>
<tr>
<td>Methods</td>
<td>Objectives</td>
<td>5</td>
<td>Objectives are not explicitly stated in any study but must be inferred from the rationale for the report.</td>
</tr>
<tr>
<td></td>
<td>Design</td>
<td>6</td>
<td>Study design is not explicitly stated in any of the four reports; but discursive reporting indicates that two articles were ambidirectional investigations [41, 43]. These two studies retrospectively investigated patients who had been admitted immediately before the outbreak and prospectively following all patients in the physical vicinity of the outbreak.</td>
</tr>
<tr>
<td></td>
<td>Participants</td>
<td>7</td>
<td>All four reports relate to maternity hospital wards and include mothers and babies. Only one report [41] provides demographic data (age). All three outbreak reports provide definitions for a case of infection.</td>
</tr>
<tr>
<td></td>
<td>Setting</td>
<td>8</td>
<td>All reports provide description of the setting (a post-delivery maternity hospital ward) with varying degrees of specificity. The bidets implicated as the mode of transmission of infection are variously described: “a handshower” [41]; ‘the bidet has two taps with a mixing arrangement’ [65]; ‘a bidet’ (unspecified) [42]. Bidet make and model, with a description were provided by Haynes, Anderson [43].</td>
</tr>
<tr>
<td></td>
<td>Interventions</td>
<td>9</td>
<td>For the three outbreak reports, the intention was to describe the investigation undertaken to isolate the origin and mode of transmission, not evaluate success of intervention. All three outbreak reports provide description of treatment and prevention regimes.</td>
</tr>
<tr>
<td></td>
<td>Culture and typing (microbiological procedures)</td>
<td>10</td>
<td>All reports provide description of environmental swabbing, laboratory investigations and organisms isolated.</td>
</tr>
<tr>
<td></td>
<td>Infection related outcomes</td>
<td>11</td>
<td>Successful resolution of all documented cases of infection were reported.</td>
</tr>
<tr>
<td></td>
<td>Economic outcomes</td>
<td>12</td>
<td>Not applicable</td>
</tr>
<tr>
<td></td>
<td>Potential threats to internal validity</td>
<td>13</td>
<td>All reports are primarily descriptive; however, they seek to establish a vector for transmission of infectious organisms thus infer a causal mechanism. Given the highly specific nature of the investigation (isolation of a particular organism in a particular location using established laboratory protocols) threats to internal validity would be low.</td>
</tr>
<tr>
<td></td>
<td>Sample size</td>
<td>14</td>
<td>Not applicable. Sample is limited to those patients acquiring infection only.</td>
</tr>
<tr>
<td></td>
<td>Statistical methods</td>
<td>15</td>
<td>All reports were descriptive in nature and only descriptive statistics were used.</td>
</tr>
<tr>
<td>Manuscript section</td>
<td>Sub-section</td>
<td>ORION Item</td>
<td>Synthesis</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------</td>
<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Results</td>
<td>Recruitment</td>
<td>16</td>
<td>Not applicable.</td>
</tr>
<tr>
<td></td>
<td>Outcomes and estimation</td>
<td>17</td>
<td>Estimation of effect size and precision is not applicable due to study design and reporting. Pragmatic outcomes were reported in all studies; for outbreak reports isolation of pathogen to apparatus associated with bidet; reduction or elimination pathogen with new disinfection and cleaning regimes and issuing of patients with personal shower rose attachments for bidet during their admission; resolution of all infection with standard treatment. In the prospective investigation outcomes reported were that normal vagina flora of patients was not altered with bidet use and standard cleaning of bidets showing gross contamination did not increase the risk of cross contamination.</td>
</tr>
<tr>
<td></td>
<td>Ancillary analyses</td>
<td>18</td>
<td>Not applicable</td>
</tr>
<tr>
<td></td>
<td>Harms</td>
<td>19</td>
<td>Harms, other than mortality rates were not reported. There were no mortalities.</td>
</tr>
<tr>
<td>Discussion</td>
<td>Interpretation</td>
<td>20</td>
<td>In all three outbreak reports it was established that infection had not occurred until the patient had arrived on the hospital ward after delivery. The mode of transmission of pathogen was isolated to a bidet-type apparatus for washing the perineum that had been colonised by a patient carrying the pathogen. Sufficient cleaning of communal bidet apparatus (and issuing patients with personal shower roses in one case) stopped the outbreak in all cases.</td>
</tr>
<tr>
<td></td>
<td>Generalisability</td>
<td>21</td>
<td>No reports discuss the generalisability of outcomes to other populations from bidet-type apparatus. However, it would be reasonable to assume that there is potential for a person with a pre-existing infectious condition, insufficient cleaning and disinfecting in the context of communal use of a bidet to transmit pathogens.</td>
</tr>
<tr>
<td></td>
<td>Overall evidence</td>
<td>22</td>
<td>The overall evidence indicates that a <code>shower-rose</code> type (unspecified) bidet and the Clos-o-Mat Samoa automatic WC is capable of being a vector for transmission of pathogens, in this case Type A Streptococcus. Appropriate cleaning is demonstrated to prevent transmission. The evidence only relates to maternity hospitals. No reports have appeared in the literature since 1994. Only four reports are extant, and one found no risk of cross contamination. It is possible that maternity hospitals no longer use bidet type apparatus that is the subject of these reports. Current use of bidets in hospital environments is unknown.</td>
</tr>
</tbody>
</table>
2.4 Discussion

This chapter provides an overview of published literature concerning the use of and research with the bidet in all health- and care-related contexts from 1909 to 2017. This scoping review is broad, encompassing all available literature from peer reviewed and ‘grey’ sources. Of the thirty-nine publications located the majority were in the lowest level of the JBI Level of Evidence hierarchy. There was only one pseudo-RCT and one quasi experimental study, indicating that research with this technology is in an embryonic stage.
2.4.1 Conflicting reports

A major feature of this review were conflicting claims concerning the capability of the bidet to cause harm or generate benefit for users. It was striking that even with strident opinions, such as a call for bidets to be added “to the list of household hazards capable of causing scald burns” [40] (p. 414) many reports neglected to describe the type, make or model of bidet that was the subject of the report.

Conflicting reports included claims that the bidet appeared to provoke urinary tract infection (UTI) or alter normal vaginal microflora in women, yet other reports found no such outcomes. A case series of 5 Japanese women [44] indicated that (unspecified) ‘high-tech toilets’ were a primary factor in provoking acute cystitis in women, suggesting that the bidet spray distributes bacteria normally found in faeces allowing their introduction via the urethra to the bladder, while a US study found that bacterial counts in urine decreased in their sample of 14 female nursing home residents toileted with an electronic bidet over three months, compared to 8 usual care control residents [35].

Of two retrospective cohort studies in Japan, one suggested an association between bidet use and altered vaginal microflora, which in pregnant women may instigate a cascade of events leading to pre-term birth [45] while another found no differences in either altered microflora or preterm birth in a large sample of bidet and non-bidet users, prompting criticism of the former study for failure to consider confounders and the effect of reverse causality [63].

More well designed, robust research would be profitable to explore these topics. In particular, UTI is one of the most common infections of nursing home residents, and its treatment with antimicrobials is frequently cited as a major contributor to the rise of multi-resistant strains of bacteria [67]. Better understanding of the role of the bidet in preventing or
provoking urethral bacterial growth would be of importance in the global health fight against multi drug resistant organisms.

2.4.2 Benefit

Positive benefits of the bidet were raised by about a third of the articles, including health practitioners’ case reports detailing success of the use of the bidet with people with varying functional incapacity and treatment of common dermatological conditions. Despite reported benefits, it is clear that there are questions that still require answering, particularly concerning the indications and contraindications for bidet use as an assistive technology and clinical treatment. Advances in bidet technology such as thermostatic control of water temperature, variable pressure of the water stream and two separate, retractable self-cleaning nozzles for ‘front’ and rear’ cleaning may have already addressed some of the harms or potential for transmission of infection presented in the literature.

The bidet appears to have potential to reduce the burden of care for families and professional carers, as well as improve the dignity of the toileting experience for dependent people, however this potential remains almost unexplored.

2.4.3 The bidet as a domestic appliance vs. a health care technology

To date, the uptake and use of the bidet has been primarily in the domestic market, with health and care services and professionals providing ex post commentary, reflective of an opinion of benefit or harm, frequently formed in the absence of robust, generalisable evidence. Well-designed research is required to establish the value of the bidet as a healthcare or assistive technology for various populations. There is little doubt however, that manufacturers and retailers will continue to develop and promote the electronic bidet, and individuals will purchase and use bidets in whatever way they choose. This results in, part, in what Friedman
and Wyatt [68] describe as the ‘evaluation paradox’; rapidly advancing technology outstrips the period required to undertake rigorous research, resulting in research outcomes being of questionable value as they are released. For example, the reported case of peri-anal burn [40] may currently be of less consequence, given the thermostatic control of water temperature provided in recent electronic models of bidet.

2.4.4 Strengths and limitations of this scoping review

Guided by a transparent and systematic framework, this review has mapped the quantity and quality of all accessible literature concerning the bidet over an extended time period. The review was comprehensive, including review of full-text Japanese articles with English abstracts by a multi-lingual speaker, to check that the abstract accurately reflected the main body of the article. The review provides a clear picture of current beliefs, assumptions and knowledge about the bidet, its current use and potential and forms a process of due diligence to guide development of further interventional studies.

Despite attempts to be comprehensive, the review may not have identified all relevant literature. It is possible that studies in other languages, for example Korean or Arabic, cultures in which bidet use is common, were not located.

Overall, the majority of studies located were observational, including significant numbers of reports of single clinicians’ experience, which prevents a clear conclusion regarding intervention effects.

There is a clear lack of well designed, robust experimental studies that explore the potential of current models of electronic bidets to assist carers of or people living with frailty or disability with this daily living task, or to examine the indications or contraindications of the bidet as a treatment for urogenital and perianal conditions. Of the 39 publications located

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for this review, only six were experimental and of these only two comprised controlled interventions. A majority of results to date are based on clinical opinion, such as therapist recommendations, and many of these are in the absence of knowledge of the type of bidet under consideration. As a result, overall findings are likely to be biased and of questionable value.

2.5 Conclusions

This scoping review has sought to identify what is known about the bidet in any health- or care-related application. There is limited and inconclusive evidence of the positive and negative impacts of the bidet. The style of bidet that is the subject of reports is frequently not described, and the variety of features and capabilities of various bidets used in different countries at different points in time do not permit comparison of results. The majority of the literature comprises clinical opinion and text articles, or studies with weak designs, and very small sample sizes.

Even with scant and inconclusive evidence, there is qualitative and anecdotal support for the use of the bidet to improve independence in toileting for children, adults and older people with a range of disabilities. It would appear that there is apriori or existing understanding by some health professionals that the bidet has potential to adequately clean and dry after voiding for people unable to carry out this intimate task. There is emerging opinion that the bidet can relieve some of the burden of care experienced by carers who would normally attend to this task.

Further investigation to robustly explore potential of the bidet to improve dignity, health and carer burden or increase risk of harm is clearly warranted.
2.6 References


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Chapter 3  Family carers’ experience of using the electronic bidet with an older, dependent family member

This chapter presents exploratory interviews undertaken with five family carers who had used or attempted to use an electronic bidet to support an older, dependent family member (the care recipient) with their toileting.

The interviews were designed to explore anecdotal reports about family carers’ and care recipients’ experiences of using a bidet. Carers were recruited from a previous assistive technology project where bidets had been supplied [1]. The aim of the present study was to understand the contexts and factors that led to acceptance or rejection of the bidet, how carers and care recipients used the bidet in daily care routines, the perceived effects, benefits and limitations of the bidet, and how these compared with manual post-voiding cleaning care routines.

As part of the first exploratory phase of the current research, the interviews also provided the opportunity to inform the design of future phases by examining the practicalities of installation and maintenance of the bidet, as well as developing an understanding of the compatibility of the bidet with other equipment required for toileting, such as toilet seat raisers or hoists. Carers were also asked how they assessed the success of the bidet in performing the job it was intended to do, in order to assist in the development of a practical and feasible measures of efficacy.

The chapter is formatted as the final version submitted to the Journal of Enabling Technologies.

3.1 Abstract

Purpose: To explore family carer experiences of the electronic washing toilet seat (bidet) with family members who are frail or living with advanced dementia. Benefits,
limitations and factors that influence the uptake and use of the bidet are investigated and will inform a future feasibility study in residential care.

**Design:** Qualitative, semi-structured interview methodology. Interviews were structured using the International Standards Organisation’s framework for usability. The constant comparative method was used for analysis.

**Findings:** Five family carers were interviewed. Technology acceptance was based on carers’ perceptions of the bidet’s ability to satisfy their physical and symbolic needs. Satisfaction of need was mediated by the capacity of the environment to support bidet technology, the performance of the bidet to clean and dry, reactions of the care recipient, and quality of interactions with health professionals. Three of the five interviewees had used the bidet over extended time periods and reported that it reliably cleaned and dried the user, and also reduced the physical strain of toileting and odour associated with incontinence. Additionally, warm water washing was reported to be helpful in stimulating a bowel motion to aid the management of incontinence.

**Research implications:** This study adds to the practical understandings influencing uptake of assistive technology by family carers.

**Practical implications:** Findings highlight how this technology may practically support families in the 24/7 care of a dependent older person and improve the dignity of assisted toileting.

**Originality/Value:** This is the first exploration of Australian family carer experiences of an electronic bidet in the care of older people.

**Keywords:** Bidet, aged, dementia, toilet, caregiver
3.2 Introduction

The Australian population is ageing. In 2016, 15% of the Australian population, were aged 65 or older. By 2056 this is projected to rise to nearly one-quarter (22%) of the population. Some of the largest increases will be in the 85 years and over cohort, with absolute numbers of people aged over 85 rising from 487,000 in 2016 to over 1.4 million by 2046 [2]. Increasing age is associated with increasing levels of disability, either through illness or the ageing process itself. In Australia, 69% of women and 56% of men aged 85 years or older reported the need for assistance with personal, self-care activities, such as showering, dressing or toileting [3].

Toileting is a complex activity requiring the ability respond appropriately to biological urge to void by mobilising to the toilet, undressing, positioning on the toilet, voiding, post-voiding cleaning, redressing and washing hands. Significant amounts of research have addressed aspects of toileting including biological and practical management of voiding problems, such as constipation and incontinence [4, 5], the use of assistive technologies such as grab rails and toilet seat raisers to promote safety and ease of using the toilet [6, 7] and bathroom design to enable a carer to safely assist a dependent person [8, 9]. However, research concerning how to maintain or promote independence in post-voiding hygienic practices for people with physical or cognitive disability are largely unexamined, despite assistance by carers in this aspect of toileting being perceived as undignified and invasive of privacy and intimate personal space [10-12]. Likewise, the impact on family caregivers of having to perform this specific, intimate task for a dependent older family member is almost absent from the literature.

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In western cultures, wiping with toilet tissue to clean after voiding is usual practice, however in many parts of the world, washing with water is the preferred method [13]. Numerous methods are available for post-voiding water washing, but in general, the term adopted for a variety of equipment for this purpose is collectively known by the French word ‘bidet’. Over the last few decades, technological advances have supported development of an electronic toilet seat bidet. This hi-tech toilet seat provides a thermostatically controlled heated seat; two, temperature, pressure and width-controlled sprays of water for post voiding cleaning of the perineum and peri-anal areas; and a warm air blower to dry the user.

A recent scoping review of literature (Chapter 2 of this thesis) found a number of observational studies and clinician reports indicating the electronic bidet may have potential to improve independence and dignity [11, 14-17]. Additionally, the warm water spray from a bidet has been reported to assist in problematic voiding by relaxing the anal sphincter or detrusor muscles, helping manage constipation, faecal or urinary retention in people with spinal cord injury and other neurological conditions [18, 19]. Such effects may impact on the independence of a person with functional limitations and the nature and amount of assistance required by a caregiver for toileting activities. Despite the potential of the bidet as adjunct to problematic toileting, currently there is only one experimental intervention using the electronic bidet with dependent older people published [20]. This controlled study of 22 female nursing home residents demonstrated improvement in the toileting experience for about half of the experimental group and reduction in bacterial load in urine compared to controls.

Given the paucity of previous research on the impact of the bidet on toileting dependent older people, a series of exploratory, in-depth, semi-structured interviews were conducted with family members who had used an electronic bidet to provide support for a family member. The aim was to explore their acceptance of and experiences with the electronic bidet, to inform a
future study on the feasibility of the bidet in a residential aged care environment. The objectives were to explore:

- Factors influencing acceptance of the bidet by care recipient and carer,
- perceived efficacy of the bidet to wash and dry the user,
- changes that may have occurred in toileting routines or associated activities after installation of the bidet, and
- any issues associated with procurement, installation, operation and maintenance of the bidet.

3.3 Method

3.3.1 Ethical approval and consent

Ethical approval for this study was granted by the University of Sydney Human Research Ethics Committee (Protocol No. 14752). Consent was viewed as an ongoing process [21]. Verbal assent was obtained during telephone recruitment and written consent prior to interview commencement. Consent was reviewed at the end of the interview and participants were asked if there was anything that they wished not to be included.

3.3.2 Inclusion criteria

Inclusion criteria for participants were that they self-identified as a carer for an older family member who was dependent in toileting, and that they had used, or had attempted to use, an electronic bidet (Coway BA-08 or Bio-Bidet) for post void cleaning with the care recipient.

3.3.3 Recruitment

Sampling was by convenience and recruitment was conducted via a third party to ensure confidentiality. Family carers who had received a bidet through a previous assistive technology demonstration project (not connected with the present study) [1] or had purchased one
independently, were contacted on behalf of the researcher by the previous project sponsor, an aged care community service provider, and asked if they were interested in participating. If so, verbal and written information about the study was provided, including an outline of interview discussion topics, notification of the intention to audio-record the interview, and projected use of the data.

3.3.4 Interview framework

Semi-structured interviews were conducted either by telephone (2 interviews) or in the participant’s own home (3 interviews). Interviews were approximately 1 to 1.5 hours long and were guided using a flexible framework of topic areas. Interviews were informal and explored issues in the order that they arose.

The interview framework was developed based on the concept of ‘usability’ [22]. This refers to a dynamic and complex interaction of a product (in this case, the bidet), a person, an activity and the environment in which the activity occurs, rather than a quality of the product itself. The elements of the framework are based on the International Standards Organisation’s three key domains of effectiveness, efficiency and satisfaction [23]. Effectiveness refers to whether a user of a product achieves a stated or perceived goal, efficiency relates to the relative benefit of using the product, and satisfaction or acceptance, represents the extent to which the user’s expectations are met and the intention to continue with the product. In addition, questions about practical issues of installation, maintenance and use of the bidet were asked as well as brief demographic information about the care relationship, functional limitations of the carer and care recipient and continence status of the care recipient. Table 3.1 outlines sample questions within the usability framework. In addition, practical aspects of installation, maintenance and use of the bidet were explored.
Where possible, the bidet equipped toilet was viewed by the researcher and with permission, photographs taken of the bidet in situ. After each interview, the researcher (MG) made field notes concerning her reactions to and impressions of the participants, the home environment and circumstances of the interview. This data helped contextualise the interview and facilitate interpretation.

Table 3.1: Carer interview framework with sample questions. Adapted from ISO usability domains [22]

<table>
<thead>
<tr>
<th>‘Usability’ domain</th>
<th>Sample questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance</td>
<td>• How willing were you to initially try the bidet with… (the care recipient)?</td>
</tr>
<tr>
<td></td>
<td>• What reasons did you have for your decision? (enablers and barriers to use)</td>
</tr>
<tr>
<td>Was the bidet acceptable for:</td>
<td>• How well was the bidet accepted by the care recipient? Initially? And over time?</td>
</tr>
<tr>
<td>1. the carer, and 2. the care recipient?</td>
<td></td>
</tr>
<tr>
<td>Effectiveness</td>
<td>• Tell me your opinions about how the bidet cleaned and dried …… (the care recipient)?</td>
</tr>
<tr>
<td>Did the bidet work as intended?</td>
<td>• What were your toileting procedures before the bidet was installed?</td>
</tr>
<tr>
<td>Efficiency</td>
<td>• What changes were there to these procedures after the installation of the bidet? (Benefits and limitations for both carer and care recipient)</td>
</tr>
<tr>
<td>What were the relative benefits of the bidet compared to usual care?</td>
<td>• Were there any changes associated with incontinence care procedures before and after the installation of the bidet?</td>
</tr>
<tr>
<td>Practical elements</td>
<td>• What information and training did you receive when you got your bidet? How adequate was this training and information?</td>
</tr>
<tr>
<td>Information and training</td>
<td>• How did you determine if the bidet had cleaned adequately?</td>
</tr>
<tr>
<td>Establishing if the bidet cleaned and dried the care recipient</td>
<td>• How did you determine if the bidet had dried adequately?</td>
</tr>
</tbody>
</table>
| Procurement and maintenance | • What are your opinions about the:
|                     | o installation,
|                     | o ease of operation, and
|                     | o cleaning of the bidet? |
|                     | • Have there been any maintenance issues with the bidet? |

3.3.5 Approach and analysis

The approach to the interview and analyses was inductive. The interview started with an open-ended question; “Tell me about your bidet…” and the interview allowed the family carer latitude to discuss what they felt was most relevant. The framework provided a comprehensive list of prompts should topics not arise as a natural part of the conversation.
Interviews were audio recorded and transcribed verbatim. Transcripts were analysed manually using the constant comparative method described by Barbour [24], Charmaz (2012) and others. The constant comparative method is an approach characterised by iterative, hierarchical processes: Initial broad themes are identified from repeated readings of the data, themes are then refined; added to or collapsed through comparing the amount of, or strength of evidence to develop empirically supported patterns of data.

This process involved reading, re-reading and indexing transcripts. Indexing is an initial process that highlights interesting and potentially relevant data, but occurs without attempting to fix meanings or construct viewpoints too early in the analytic process. Seale [25] argues that indexing avoids drawing premature conclusions that may “stultify creative thought, blocking the analyst’s capacity for seeing new things” (p.154). During initial readings of transcripts, quotes or key words that captured similar concepts, ideas or views were grouped to form an index. Indices were progressively built through sorting of key words and quotes into broad themes. Each index was then reviewed to determine if the data had conceptual coherence. Data that did not ‘fit’ an index was either added to another index or a new index was created.

From the indices, a provisional coding frame was developed. The coding frame consisted of a tabular representation of themes arising from each of the five interviews. This allowed collation of data into manageable amounts and gave visual representation of the amount of data contained within each theme. The emergent themes were discussed with the second author (LC) and refined and the coding frame further developed to generate sub-themes. Support for themes and sub themes was determined by examining relevance and frequency with which interviewees spoke about each theme. Corresponding negative categories were included in codes where relevant. Data was then searched for patterns, contradictions or disconfirmations.
3.4 Results

3.4.1 Participants and context

From a potential participant pool of sixteen families who had participated in the previous study or had independently purchased a bidet, only five were able to be contacted by the community service provider who undertook recruitment. All five families agreed to participate.

The five participants had formerly provided or were continuing to care for an older family member who was unable to independently attend to toileting, including post-voiding cleaning. At the time of installing the bidet, each care recipient was in receipt of Australian Government funded community care services, four in their own home, and one in a low-care residential aged care home.

Each care relationship was different. Three carers were adult daughters; one a former nurse, had moved into her mother’s home to provide support as her mother’s dementia progressed; another daughter, a retired primary school teacher had moved into her mother’s home to provide care after multiple falls and increasing cognitive confusion. A third daughter, an occupational therapist, was supporting her mother and managing care arrangements for her frail father who had dementia and an undiagnosed bowel condition, resulting in excessive use of the toilet. Two interviewees were spouses, both retired; a wife was caring for her husband with advanced Parkinson’s disease, characterised by slowness of movement, muscular rigidity, cognitive deterioration and psychosis, and a husband was caring for his wife with advanced dementia.

All carers reported their health was good. Four were physically able to assist the care recipient, one carer reported having a ‘bad back’ from unspecified cause, but still assisted his wife with transfers. All of the care recipients were incontinent, due to a range of reasons from
being unable to mobilise to the toilet in time, to urinary and faecal incontinence secondary to advanced dementia.

3.4.2 Themes

The major findings were that acceptance of the bidet was based on the carers’ perceptions that the bidet addressed their self-identified needs. Carer needs are located within a context of their physical environment, interactions with other people and the perceived performance of the bidet technology. Figure 3.1 illustrates the relationship of the themes and sub themes that emerged.

![Figure 3.1 Diagrammatic representation of major carer identified themes and subthemes. Note: AT – assistive technology.](image)

3.4.3 Needs

Three key themes emerged related to the needs of the carer when managing cleaning after voiding for a dependent older family member.
Task imperative

The first theme related to the necessity of cleaning after voiding. Unsurprisingly, cleaning was considered essential by all participants. Carers underscored the imperative to clean largely through discussing negative outcomes if cleaning was not attended to thoroughly. One carer described the importance of the task by stating: ‘I didn’t want her to get a urinary tract infection... and I didn’t want her to have any area that was sore because it wasn’t cleaned properly’ (Carer S)

Symbolic need

During the interviews it emerged that being able to effectively manage post voiding cleaning whether by bidet or manual methods held symbolic meaning for each family. Three sub-themes emerged. The first was that cleaning was a symbol of devotion to the care recipient, sometimes to the point of an almost shared experience of the care recipient’s body. The pronoun ‘we’ was a recurring feature in the language of the interviewees descriptions of toileting and related care, even if the care recipient could not meaningfully communicate or participate:

Interviewer: Did you ever have any problems with urinary tract infection?

Carer: Um, every now and again, but when I looked after Mum (referring to his wife) at home here for six years (Interviewer: wow) so um... well, we got onto it very quickly...”

(Carer S).

Cleaning is a basic self-care activity, but it also carries with it the potential to symbolise aspects of personhood and commitment in relationships. One daughter reflected on the reluctance of her mother to use the bidet with her father by stating: "when we think of taking the burden (of cleaning after voiding) away we might be not just taking away a burden or task, but what the task represents ...” (Carer L1).
Despite having a bidet and care staff available, this carer continued to clean her husband after voiding when they moved to adjacent rooms in a nursing home. Her daughter reported that “...every five minutes during the day Dad would go to the toilet... but when Mum came in (to the nursing home) she was continually getting up and following him, cleaning his bottom. I’d say, ‘the nurses will do that’ but oh no, no, no Mum had to do that” (Carer L1).

Secondly, the ability of a carer to manage basic care symbolised a commitment to keep the care recipient at home. Toileting, including management of incontinence, is unlike other personal care such as showering, which can be attended to at pre-arranged times by community care service providers. Family carers require the ability to manage toileting 24 hours and day, 7 days a week. As one carer expressed when a bidet was suggested by the service provider “I agreed straight away. I said, “well anything that will keep (care recipient) at home would be great” (Carer D).

Thirdly, carers were attentive to the care recipient’s sense of dignity, even in the presence of severe dementia. One carer saw the bidet as reducing the need for invading her mother’s intimate personal space: “The bidet was a big hit ‘cause it just gave (care recipient) a bit of dignity... a bit more privacy” (Carer L2).

Before use of the bidet carers indicated that there was no way of managing clean-up other than intrusive, manual assistance. Autonomy for the care recipient was lost, and they attempted to manage the task in the most dignified was they could. However, after the introduction of the bidet, two carers’ commented on how the bidet gave some autonomy back to the care recipient, enabling the care recipient to retain a sense of identity as an adult person. Carer J took great care in the interview to repeatedly describe her husband as a “very clever man, very bright and intelligent” and how hard it was for both of them as he lost function and mobility: “... it was very, very hard in the end, he could no longer weight bear... he couldn’t
stand... he thought he could still walk, because of all the drugs, see, it caused a bit of psychosis... he’d be wanting to get up and walk...”. However, he was able to use the bidet himself which reinstated, in part at least, Carer J’s perception of her husband as that intelligent, capable man he once was: “all the instructions were here (points to wall beside toilet) and (care recipient) could use these himself, so he could put the water on to clean... yeah... it worked out beautifully. (Stands up straighter and smiles) It was really good, he liked it – he thought it was pretty good!” (Carer J).

**Physical need**

The physicality of assisting a dependent person to stand in a semi-upright position for post voiding cleaning is often considerable, especially if they are tall or overweight. The descriptions of how carers managed post voiding cleaning prior to trialling a bidet indicated the need for sometimes elaborate arrangements with rails and specific mobility equipment that physically support the care recipient. Again, the experience of using the bidet highlighted the physical strain of manual care. Prior to the bidet, physical strain was reported as something carers just needed to put up with as best they could. Carer D described this situation of keeping on going, despite significant back pain: “But, that's what I say, if you're going to give up, you give up. If you’re going to keep going, you gotta keep going... And that's what we've done”. Reflecting on how the bidet had changed the physicality of clean up Carer D continued “…it saved me a hell-of-a-lot…, it saved me from bending like an octopus. If you've ever tried to clean someone up... It’s bloody near impossible... Yeah, I said to (indicates toward son)...you've got to be a contortionist”.

**3.4.4 Context**

While carers’ perceived needs appeared to influence initial receptivity towards the bidet, continued use appeared to be moderated by three additional factors.
**Environment**

Even if carers were keen to use the bidet, sufficient space in the bathroom or toilet for bidet compatible mobility equipment was required as care recipients physically deteriorated. Two care recipients eventually required hoists or an attendant propelled mobility aid. One bathroom was remodelled to accommodate equipment which allowed continued use of the bidet. Where a hoist could not be accommodated in a domestic size toilet room, the bidet was rendered unusable.

The bidet itself was able to be adapted to suit a variety of care recipients. For example, Figure 3.2 shows an example of a modification to suit a care recipient with a height of 190.5cm.

![Figure 3.2 An adapted bidet toilet in situ. (Photo used with permission).](image)

**Interactions with others**

Ongoing use of the bidet also appeared predicated on the reactions of the care recipient and the assessment, support, initial and ongoing training delivered by health professionals.
Three of the five care recipients were reported to have positive reactions to their first experiences of the bidet. When first installed, two care recipients were able to operate the bidet themselves with only minor prompting. One carer described her mother’s reaction as:

“I think she used to think she had something luxurious and nice... she liked it... she was telling her friends to get one and everything!”  
(Carer L2).

The third positive reaction was elicited from a care recipient with advanced dementia. Her initial response was described as “The first time we used it she sat there and laughed!” (Carer D). As the care recipient’s usual behaviour in the shower was to scream in distress, the response to the bidet was a delightful surprise for her husband.

Two carers did not use the bidet, despite it being installed. One carer reported using the bidet only once. During the first trial her mother "jumped up as if someone had given her an electric shock" (Carer S). The carer could not recall what settings she has used and therefore it was not possible to postulate whether the water pressure or temperature contributed to the reaction. Subsequent discussion revealed that this carer did not recall receiving support in the operation and use of the bidet, even to the point of being unsure whether the bidet had one or two cleaning nozzles and in terms of operation she asked, “with the bidet, are you meant to wipe somebody first and rinse off or was the bidet supposed to do everything?” (Carer S).

The daughter who provided a bidet to ease what she perceived as her mother’s burden of care for her father reflected that “my enthusiasm for solving the problem was, you know, greater than my listening (to her parents’ objections)”. She continued; “Never be a therapist to your parents... if it was someone else I probably would have worked through all the issues... Mum was probably, you know, humouring me and she unfortunately never really used it....it was just too much for her” (Carer L1).
Quality of interactions with professional staff appeared to have influenced not only initial acceptance of the bidet but continuing use. One carer described why he stopped using the bidet as his wife's mobility declined. His wife required a mobile shower commode chair over the toilet, however, the bidet had been programmed only to operate when a person was seated on it. While he was aware the seat sensor needed to be activated to enable bidet operation, he had not received information nor was aware of the ability to reprogram. He stated: “we wanted to use the commode chair, but you've got to hold your hand on the (bidet) seat to sensor it. So if we had one (bidet) without the sensor we could still use it!” (Carer D).

In contrast, another health professional had worked with the carer and care recipient to develop simplified instructions for bidet operation, successfully supporting the care recipient to use the bidet as independently as possible.

**AT effectiveness and efficiency**

Carers and care recipients who used the bidet reported that it cleaned and dried effectively. Each carer worked out individual routines with the bidet that suited their situation. One care recipient used the rear wash up to three times to feel that the bidet had ‘cleaned well’ and one carer recommended using the dry function twice to make sure that all moisture had evaporated. To develop confidence in the bidet, carers initially were diligent in checking that the bidet had done an adequate job. A ‘pat down’ with toilet paper was the primary method to check for any residual moisture or residue. One carer reported that there was no need to use toilet paper, another ceased using ‘wet wipes’.

In addition to cleaning after voiding, the three carers who consistently used the bidet all reported further advantages. The bidet appeared to be an effective stimulant to produce a bowel motion. One carer noted that they would put on the warm water rear cleaning programme and
"Well, he'd sit there for a while shortly later, he'd be able to go, it was wonderful" (Carer J). Another remarked "We used to take Movicol for that (constipation) ... but we didn't seem to take it as much once we had the bidet" (Carer L2). A third carer who monitored the care recipient’s bowel movements noted "if she hadn't been for a few days we'd put her there so she'd go... and it works. It works, I know it works!" (Carer D). This carer also found that using the bidet gave some control over daily ‘timing’ of a bowel motion, which reduced episodes of incontinence and the number of incontinence pads required.

Another carer noted that the bidet “stopped things from being a bit smelly if (care recipient) hadn’t a shower” (Carer L2). The bidet was not considered a replacement for a shower, but it reduced the need for washing the lower half of the body between showers. The carer continued “if they don't shower for 2-3 days, you really need to hand wipe or something... (interviewer; um hum) ... you need to do a bird bath. It stopped the need for all of that, you know I didn't need to... do a bird bath type of wipe or anything ...” (Carer L2).

3.4.5 Limitations, adverse events and maintenance of the bidet

The only maintenance issue reported was the requirement to replace batteries in the remote-control unit. One carer reported that when the batteries failed, the washing and drying programs pre-set by the carer were lost. One carer reported that the heated seat was ‘too hot’ and that the carer was concerned the seat would burn the care recipient. It was not possible to ascertain if this was a fault in the bidet, or whether the carer was not aware of different heat settings on the remote control. The situation was managed by turning the seat heater off.

Operation of the basic functions of the bidet (i.e. front and rear washing and drying) was reported to be straightforward by the carers who had used the bidet.
The bidet appeared to be robust and reliable. Reported limitations around its use were related to broader environmental issues, such as the inability to get a hoist in to the toilet room, or inadequate knowledge of operation of the bidet, as described above.

3.5 Discussion

This study aimed to explore family carers experiences of using an electronic toilet top bidet with a dependent older family member. Topics concerning acceptance, efficacy, changes to care routines and practical issues with the bidet and its use were explored. Results are intended to inform a feasibility study of the bidet in a residential care home. Findings are discussed framed by the ISO domains of effectiveness, efficiency and acceptance [23].

3.5.1 Effectiveness

Effectiveness of a product is the extent to which it does what it is intended to do. Viewed simply as the bidet’s capacity to clean and dry the perineum and peri-anal areas after voiding bladder or bowel, the bidet was reported to clean and dry the user effectively by the three carers who used it with an older, dependent family member. There were variations in the way in which the washing and drying programs were used, but these appeared to be about personal preference rather than a necessity to ensure the bidet was doing the task intended.

3.5.2 Efficiency

Efficiency is a broader concept that involves perceived advantages of a product relative to performing a task another way. Carers commented on relative advantage of the bidet over usual, manual clean up in number of ways that impacted both the care recipient and the carer.

Improving the dignity of the care recipient, either by giving privacy or giving back autonomy over this intimate task was considered important. Researcher impressions recorded immediately after the interviews indicated the use of the bidet contributed to a sense of ‘normalising’ relationships through enabling the care recipient to attend to this task largely
independently, despite the need for the carer to assist with other toileting activities such as mobilising to the toilet and undressing. For the care recipient, it is tempting to postulate that having assistance with wiping may symbolise a loss of identity, from ‘person’ to ‘disabled’ [12], or the completion of a process of regression from adult to infant. There was a subtle sense in interviews that for some carers, wiping after using the toilet represented a threshold where their former role in the relationship, for example, ‘daughter’ or ‘wife’ was subsumed by the role of ‘carer’.

Carers who used the bidet each perceived individual advantages over manual cleaning. These included; decreasing awkward posturing and physical strain, reducing odour associated with incontinence, limiting the need for additional showering, and reducing the number of incontinence pads through better management of the care recipients’ bowels. Using the bidet to prompt defecation has also been noted in three studies: A warm water stream from a bidet has been shown to decrease anal resting pressures, making it easier to open the bowels [26, 27]. This resulted in reduction of the time taken to defecate for individuals with spinal cord injury, who have no conscious control over contraction of the rectal muscles [18].

3.5.3 Acceptability

Acceptability suggests a dichotomous relationship; either the device is acceptable or not. This study presents a more complex set of circumstances that underpins acceptability of the bidet. Findings support a conceptual model of predicting assistive technology (AT) usage that is characterised by ongoing evaluation of perceived benefits and relative advantage of the AT [23]. In this model, shown diagrammatically in Fig 3.3, benefits and relative advantage are mediated by a range of contextual factors, similar to those found in this study, including environmental considerations, quality of the AT, user reactions and interactions with others, including health professionals.
This model predicts that if an individual is given the opportunity to use a bidet, they would determine the relative advantage of the bidet, and then form an intention to use it (or not). Intention is mediated by individual context, including environmental constraints, the task to be performed, the person and aspects of the AT itself, such as ease of use. If used, impact and benefits of use are monitored, allowing the individual to form a perception of relative benefit. Benefit is compared against the benefit of other intervention options, such as manual cleaning.

Findings from this study add to the understanding of what comprises perceived benefit, and the nature of complexity of context. Findings indicate that perceived benefits of an AT need to go beyond simple effective task performance by the AT, to include impact at a symbolic level, that is, understanding what the task represents and how the AT under consideration affects this. For some carers, the opportunity for greater dignity or role normalisation appeared to be powerful factors that prompted continuation of use of the bidet, while for others, rejecting
the bidet and performing the task manually appeared to be symbolic of delivering the best possible care or expressing devotion to the care recipient. Findings also suggest that the contextual factor of professional involvement, as part of the service provision process, may influence us through each element of the model. The service provision process for AT for older people has been described as an ‘enigmatic journey that could take unexpected turns’ [28] (p.307) and thus emphasises the need for health professionals prescribing AT to be proactive and available to solve unanticipated problems as they arise, over time. It is therefore not only the impact of the AT, but the impact of the delivery of appropriate and timely support that may influence perceived benefit.

### 3.5.4 Implications

This study has demonstrated that the bidet can be used effectively for cleaning after voiding bladder or bowels for a dependent older person. The bidet has potential to reduce carer physical strain associated with cleaning after toileting, improve the dignity of the care recipient and may have implications for the management of incontinence. The reported effect of the bidet to ‘prompt’ a bowel motion could be profitably explored in aged care environments: Timed toileting, that is taking an individual to the toilet at specific time intervals (usually 2 or 3 hourly) is a common technique for incontinence management in nursing homes, but there is little evidence of its efficacy, especially for people living with advanced dementia who may not have capacity to understand what is expected of them at a toilet visit [29]. However, the combination of the use of timed toilet visits with the effect of bidet to prompt a void could be investigated to determine its utility in the management of incontinence.

Findings also underscore the need to understand what tasks represent for carers at both a practical and symbolic level when prescribing AT as well as the potential requirement for ongoing professional support for carers and care recipients as care needs change.

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3.5.5 Limitations and strengths of the study

Key limitations of this study are the small number of participants and a sample of convenience. The sample may be atypical of carers generally. Theoretical saturation of data, as described by Glaser and Strauss [30] was not achieved. There is no assertion that all relevant characteristics and contexts have been explored. Cost of AT in general has been shown to be a barrier to acceptance and use [31] however this was not a consideration in this study as most carers obtained a bidet, free of charge, as part of a previous demonstration project.

Strengths of the study were the diversity of opinion and experience. Within the sample there was both acceptance and use, as well as rejection of the bidet technology. A further strength was that all carers had first-hand experience of using the bidet with a dependent older family member, which lends ecological validity to the findings.

3.6 Conclusion

The electronic bidet provided an effective alternative to manual, post voiding cleaning for the individuals who used it regularly. The decision of the carer to use the bidet appeared predicated on a variety of factors including carer perception of how the bidet would meet their perceived needs, which were mediated by factors in the physical environment, the reactions of the care recipient to the sensation of using the bidet and support by health professionals. Longevity of use appeared to be influenced by perceived relative advantage of the bidet at both practical and symbolic levels.

Use of the bidet was, in general straightforward, the bidet itself was robust with no maintenance issues reported. A number of additional advantages including reduction of carer physical strain in the toileting process and the potential of the bidet to support incontinence management programs warrant further investigation. Findings support a larger trial in a residential care environment.
3.7 References


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Chapter 4  Toileting in dementia-specific aged care using the electronic bidet: a mixed-methods, feasibility study.

This chapter presents the second phase of this body of work. A single-arm feasibility study was conducted in a 14-person dementia-specific unit of an Australian Government funded aged care home (ACH). The main objectives were to explore issues with installation, acceptance and use of the electronic bidet by residents and staff, as well as test the practicality and feasibility of data gathering measures for use in a future controlled study.

The chapter is formatted as the final version to be submitted to the Journal of Enabling Technologies.

**Title:** Feasibility of electronic bidets in residential aged care

**Abstract**

**Purpose:** Determine the feasibility of electronic toilet-seat bidets for post-voiding cleaning in a dementia-specific residential aged care home (ACH) and develop measures of clinical utility.

**Design:** Single-arm, sequential explanatory, mixed-methods design. The 12-week study was conducted in a 14-place dementia unit of an Australian ACH. Eight bidets were retrofitted to toilets. Outcomes were measured using observational scales and focus groups.

**Findings:** 15 residents and 16 staff participated. Resident demographics were, average age 84.7 years, 13 female. All had dementia, were dependent in toileting and incontinent. The bidet was acceptable for residents and staff; it cleaned effectively in 53% of 335 episodes of faecal incontinence, and 74% of 65 cases of faecal void. Workload for staff reduced through reduction of physical strain of toileting and less showering of residents after incontinence: The warm water washing function of the bidet appeared to prompt a void of bladder or bowels at

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the toilet visit, which reduced overall incontinence. Expenditure on incontinence products reduced by $A1821 compared to the preceding 12 weeks. No adverse events or maintenance issues were reported.

**Research implications:** Preliminary, positive results indicate feasibility in Australian aged care settings and suitability for a larger controlled trial. Measures of acceptance and cleaning were practical, measures of assessing resident behaviour and staff workload require refinement.

**Practical implications:** The bidet is practical, may reduce staff workload and be more dignified for residents.

**Originality/Value:** The first Australian study of the electronic bidet in ACHs.

**Keywords:** Bidet, aged, toilet, feasibility, nursing home

**Paper type:** Research paper

### 4.1 Introduction

The ability to clean after voiding bladder or bowels is a fundamental skill for independent living. It is an essential part of the toileting process, comprising mobilising to the toilet, undressing, elimination, post-voiding cleaning, redressing and handwashing. Cleaning is a complex self-care activity, mastered in childhood and practiced throughout life, unless a decline in physical or cognitive ability through injury, disease or ageing results in difficulty or incapacity in managing this task.

In aged care settings, toileting is the most common personal care assistance provided by staff, comprising nearly a quarter (21%) of all care tasks [1]. Regular, scheduled toilet visits are a major component of nursing home continence promotion programs [2-4].

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Insufficient post voiding cleaning is associated with negative outcomes for older people in care, including greater risks of urinary tract infection [5], increased incidence of breakdown of skin integrity [6, 7], and loss of dignity [8]. Internationally, aggression toward residential aged care staff has been found to occur most frequently in the context of intimate personal care activities, including toileting [9-11]. For people living with dementia, efforts by aged care staff to attend to post-voiding cleaning may be misinterpreted as an invasion of privacy, and responded to with distress, resistance or aggression [12]. For aged care staff, the regular need to assist with post voiding cleaning has been reported as stigmatising and associated with low occupational status [13].

Despite its importance and frequency, little is published about how toileting is carried out in aged care with respect to post-voiding cleaning [13]. Commonly, staff clean using toilet paper, damp face washers or as necessary, showering the lower half of the body. An alternative to western traditions of wiping the perineum with toilet tissue after voiding is washing with water. In many parts of the world, post-voiding washing is carried out using sanitary ware known as a bidet. Traditionally, the bidet comprises a ceramic, seat-less toilet pedestal with hot and cold running water or a hose arrangement with a small shower head next to the toilet (see Figs. 4.1 and 4.2).

*Figure 4.1 A modern ceramic freestanding bidet adjacent to the toilet pedestal*
More recently, advances in technology have supported the development of a toilet seat replacement bidet that delivers an electronically controlled water wash and air dry for post voiding cleansing (see Fig 4.3).

Electronic bidets have been recommended for people of all ages with functional limitations [14-19] however, there is very limited evidence concerning clinical efficacy or utility to guide their use. There is one US intervention study that compared bidet assisted toileting against usual, manual toileting care with nursing home residents. Using qualitative techniques and microbiological urinalysis, this study demonstrated an improvement in the toileting experience for about half of the residents and staff. This was achieved through
improved levels of privacy, resident satisfaction with staff assistance and for staff, relief from some of the emotional and physical stress associated with toileting. It was also noted that after 2 months of regular bidet use there was a decrease in bacterial colony counts in the urine of residents in the bidet condition, although no explanation was offered for this finding [20]. This research has not been corroborated and there are no extant validated measures for examining outcomes or utility of new technologies for post voiding cleaning.

Electronic bidets are presented an alternative to usual, manual post-voiding care but the feasibility and acceptance of this alternative for both residents living with dementia and staff in Australian aged care settings is unknown. Evidence of the capacity of the bidet to clean after episodes of voiding bladder, bowels or after incontinence is primarily anecdotal. The primary aim of this study was to explore the feasibility, acceptance and utility of bidet use in a dementia specific aged care facility. The secondary aim was to develop and test measures of effect, acceptance and utility of the bidet for residents and staff.

4.2 Methods

4.2.1 Study design

A single arm, sequential explanatory mixed-methods design was used [21]. Pre- and post-quantitative observational measures were used and where appropriate residents acted as their own controls. Two focus groups were conducted at the end of the 12-week study, one with assistants-in-nursing and one with the aged care home (ACH) manager and senior nursing staff. Two additional interviews were conducted, one with the facility maintenance manager and one with the accountant, to explore quantitative results and obtain additional qualitative data on installation, maintenance and costs associated with the bidet in practice.
This study was approved by the University of Sydney Human Research Ethics Committee, protocol 14752. Written consent was obtained from all participants. Where residents with dementia were unable to provide informed consent, a responsible person provided written consent and verbal assent was sought, where possible, from the resident.

4.2.2 Participants, sampling and setting

Sampling was by convenience. Participants were permanent residents and staff of a 14-bed high-dependency unit of an 84-bed Australian Government funded dementia-specific residential ACH on the Central Coast of NSW.

Inclusion criteria for residents was dependence on one or more staff for physical assistance in cleaning after toileting. No exclusion criteria were set. Staff selected eight residents with whom they experienced the most difficulty in maintaining personal hygiene after toileting and provided reasons for inclusion. Participants were initially limited to the number of bidets available, however as the study progressed staff toileted other residents of the study unit using the bidet equipped common area toilet. Data was collected for these residents following receipt of consent for study participation.

Staff who normally worked in the unit were invited to participate. No exclusion criteria were set.

4.2.3 Intervention and procedure

The intervention comprised staff use of an electronic toilet seat bidet to water wash and air dry the perineum and peri-anal area of residents at each toilet visit.
**Equipment**

The Coway BA-08 bidet (Wongjung Corp., Korea) was used (Fig 4.3). The bidet replaces the usual toilet seat. It provides a thermostatically controlled seat heater; two, self-cleaning, retractable water spray nozzles for front (perineal) and rear (perianal) cleaning in three widths of spray. Water temperature and pressure can be modified to suit the user and a ‘massage’ function is available. An adjustable temperature, warm air blower dries the user after washing. Operation is by a remote control, which can be mounted on either side of the toilet seat or located elsewhere. The bidet was programmed to function only when a person is seated on it. Bidet washing and drying functions do not have to be used and the bidet can function as a usual toilet seat if required.

**Installation**

Eight bidets were purchased (retail cost at October 2017 was $A1,290 per unit) from a commercial supplier by the purchasing department of the participating ACH. A usual commercial relationship was maintained with the supplier, and no conditions (actual or implied) were placed on the ACH or researcher by the supplier. In accordance with design practices of the participating organization, each toilet seat was treated with a black plastic bonding paint by the supplier at no additional cost, to provide adequate visual contrast of the toilet seat with its surrounds to support residents with visual-perceptual impairment. (See Figs. 4.4 and 4.5)
The facility carried out installation, including installing a new, regulatory compliant electrical power point. The bidet uses the existing water supply for the toilet cistern. An occupational therapist (MG) assessed and supplied residents’ requirements for compatible toilet seat raisers and rails as required. The bidet remote control was housed in a ‘tamper proof’ holder supplied by the retailer (retail cost of $A16.50 at October 2017) that allows access by residents, if desired, to one button that activates a pre-set washing and drying program (see Fig. 4.6). The remote-control holder could be attached to an adjacent wall with double sided tape, but more frequently staff chose to place it on a shelf behind the toilet.
Staff training

A similar bidet (Bio Bidet 1000 BBC Innovation Corp., USA returned from a previous study) was installed in a staff toilet. Staff were encouraged to use the bidet to familiarise themselves with the sensation and operation of the bidet prior to using with residents. One assistant in nursing of the intervention unit was invited to champion the study. The champion received training in the operation, cleaning and maintenance of the bidet from the retailer, at no additional cost in accordance with their usual after sales service arrangements, and subsequently used a train the trainer approach with unit staff.

All unit staff were invited to a study briefing at baseline explaining the study aims and data gathering procedures. The briefing was repeated at 6-weeks for staff new to the unit or those who has missed the original briefing.

4.2.4 Measures

Information was collected from residents’ files and measures completed by staff. A resident toileting ability scale was adapted from the ACH’s usual resident assessment data collection for Australian Government funding purposes (a sample is attached at Appendix 1). A five-item Likert scale was developed to measure resident acceptance of bidet (a sample
Likert Acceptance Scale is attached at Appendix 2). A toileting data checklist was generated to measure time taken in toileting activities, the bidet’s ability to clean and dry, the nature of resident behaviours of concern during toileting, and staffs’ physical strain associated with toileting (a sample toilet data checklist is attached at Appendix 3).

Measures were developed in consultation with staff. Two assistants-in-nursing worked with one researcher (MG) to develop operationally meaningful categories within each domain that reflected staff experience, opinions and used language with which staff were familiar. Scales were drafted, reviewed and revised. Each domain is described below and a schedule of data collection summarising baseline and outcomes measures is at Table 4.1.

Table 4.1: Summary of measures and data collection timepoints

<table>
<thead>
<tr>
<th>Measure</th>
<th>Timepoint</th>
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<tbody>
<tr>
<td></td>
<td>Baseline</td>
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<tr>
<td><strong>Baseline measures</strong></td>
<td></td>
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<tr>
<td>Demographics</td>
<td>X</td>
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<tr>
<td>- Age</td>
<td></td>
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<tr>
<td>- Gender</td>
<td></td>
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<tr>
<td>- Time since admission</td>
<td>X</td>
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<tr>
<td>- Diagnoses</td>
<td>X</td>
</tr>
<tr>
<td>- Mobility status</td>
<td>X</td>
</tr>
<tr>
<td>- Continence status</td>
<td>X</td>
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<tr>
<td>Toileting status</td>
<td>X</td>
</tr>
<tr>
<td>Outcome measures</td>
<td></td>
</tr>
<tr>
<td>Acceptance of bidet</td>
<td>X</td>
</tr>
<tr>
<td>Time spent in toileting</td>
<td>X</td>
</tr>
<tr>
<td>Type of void</td>
<td></td>
</tr>
<tr>
<td>Cleaning ability of bidet</td>
<td>X</td>
</tr>
<tr>
<td>Behaviours of concern</td>
<td>X</td>
</tr>
<tr>
<td>Staff physical strain</td>
<td>X</td>
</tr>
</tbody>
</table>

*Baseline measures*

Demographics and resident characteristics

Demographics collected from residents’ aged care files were: age, gender, time since admission, principle and secondary diagnoses, mobility status (independent, independent with
mobility aid, 1 or 2 person assist), continence status (faecal and urinary incontinence, yes/no; reason/s for incontinence).

No demographic data was collected from staff.

**Toileting status**

Residents’ toileting ability was rated by 2 staff from different shifts on a 4 point-scale as independent (no staff assistance required), supervised (reminders are given to use the toilet), verbally prompted (step-by-step verbal instruction is required or the resident forgets steps in the process), or physically assisted, (the staff member is required to physically perform an aspect of toileting for the resident), on six aspects of toileting: undressing to toilet, positioning on toilet, cleaning perineum, cleaning perianal area, redressing, and washing hands. Incontinence management strategies as per each resident’s care plan and reasons staff gave for recommending residents to the study were recorded as free text.

**Outcome measures**

**Resident acceptance of bidet**

Resident reaction to the bidet was rated on a 5-item Likert scale ranging from 1= appeared to dislike the experience to 5= fully accepting of the experience, within the first three days of bidet use, and again in week 12 or on the resident’s last day of residency. Two staff from different shifts were asked to observe the resident immediately before, during and after bidet use, noting facial expression, body language, any vocalisations or other reactions in the week before completing the rating. If ratings differed, staff discussed reasons to reach consensus.

**Time spent in toileting**

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Time spent in toileting activities was recorded in minutes and seconds by stopwatch on entering and leaving the bathroom. Time taken for usual toileting care was recorded one week prior to commencing bidet use; time taken for toileting with bidet was recorded in week 1 and repeated at week 12.

**Type of void**

Type of void was recorded by staff for each toilet visit: (i) type of void (urine, faeces, both, no void); (ii) previous incontinence (urine, faeces, both).

**Cleaning ability of bidet**

Ability of the bidet to clean and dry was rated by staff for each toilet episode after discrete visual inspection and ‘pat down’ with toilet paper, as: (i) successful, indicating no further cleaning was required; (ii) additional wipe required, or (iii) shower of lower body required (‘half-shower’).

**Behaviours of concern**

For each toilet visit one week prior to and after commencement of bidet intervention, staff rated behaviours of concern as: (i) none, (ii) verbal, defined as any negative verbalisation about the toilet/bidet or directed at staff; (iii) physical, defined as any physical agitation or aggression directed at self, staff or equipment, or (iv) both verbal and physical behaviour.

**Staff physical strain**

Staff physical strain associated with toileting was rated by staff at each toilet visit on a 4-point Guttman scale: (i) comfortable; (ii) muscle strain, defined as physical discomfort (iii) muscle tension, defined as prolonged physical discomfort (such as physically supporting a

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resident) or (iv) twisting, defined as reaching around while also physically supporting a resident.

**Cost of incontinence products**

Monthly cost of incontinence products for the whole facility was obtained from the organisation’s finance department. Costs during the 12-week study period were compared with the 12-weeks preceding the study and the corresponding 12-weeks of the previous financial year. Facility records were examined for variables that may affect incontinence product costs. These were (i) increase in the number of respite bed days (respite residents provide their own incontinence pads), (ii) increase in bed vacancy and (iii) outbreak of gastric-related conditions that would increase numbers of incontinence products used.

**4.2.5 Qualitative measures**

**Staff perceptions of utility**

Two semi-structured focus groups or interviews were conducted to explore staff perceptions of (i) the utility of the bidet; (ii) outcomes for residents; (iii) effects on workload and workflow; and (iv) to provide comment on the feasibility of data gathering tools and procedures. One focus group comprised direct care staff, and a second comprised one senior clinical staff and managers. Groups were conducted separately to encourage open communication between peers. One face-to-face interview was conducted with the facility handyman to determine issues with installation, technical performance of the bidets and impact on power and water use at the facility. Focus groups were co-facilitated by the researcher and a member of the host organisation’s policy and service planning unit. Groups audiotaped and transcribed for analysis. Two interviews were conducted, one with the facility accountant and another with the maintenance manager. Detailed notes were taken.
In addition, one investigator (MG) visited the facility weekly to provide support for staff, address any issues with the bidet and record field notes about ongoing reactions to and use of the bidet.

4.2.6 Research approach and analyses

The intention-to-treat principle [22] was used in quantitative analyses. All results were included regardless of length of time participants were involved in the study or degree of staff compliance with the study protocol.

Quantitative data was entered into Microsoft Excel Version 15 and descriptively explored using frequencies and percentages. To explore differences between pre- and post-bidet measures, comparison of means was undertaken. No further statistical testing was undertaken due to very small numbers of pre-intervention observations. Ratings of bidet acceptance were analysed as change in median and modal scores over time; utility measures (time spent in toileting, ability of the bidet to clean and dry, behaviours of concern and staff physical strain ratings) are analysed as frequency counts and percentage change over time.

Analysis of focus groups was conducted using a directed content analysis approach [23]. This approach commences using deductive methods, involving use of a question framework to explore the topics examined by quantitative data collection, including feasibility of data gathering tools. Inductive methods were used to explore experiences with the bidet over time and feelings about the changes to work practices. Analysis thus involved the use of apriori codes that reflected the topics of the quantitative study, and thematic analysis was used to develop new codes when the data did not ‘fit’ the pre-existing codes.
Quantitative and qualitative results were synthesised, using a sequential process of quantitative results informing qualitative methods, then qualitative results being used to explain quantitative results [21].

4.3 Results

Quantitative and qualitative results are presented under each topic area of the investigation.

4.3.1 Participants

Resident characteristics

Fifteen residents participated in the study. No resident or their representative who was invited declined to participate. Average age was 84.7 years (range 71-98) and the majority (n = 13) were female. Median length of stay in the aged care home was 26 months. All residents had a diagnosis of dementia, and between 1 and 13 (average 5.8) other chronic co-morbidities. All residents were ambulant, but the majority required 1-person assistance with transfers. Resident characteristics are presented in Table 4.2.

No resident voluntarily withdrew from the study. Four residents were discharged from the ACH during the study to a higher level of care.

Incontinence

All 15 residents were incontinent of both urine and faeces. Primary reasons for incontinence reported by staff were: dementia, resulting in lack of awareness of voiding; the inability to remember location of toilets; and challenging behaviours associated with toileting. Four residents had difficulty mobilising to the toilet and four had a medical condition which...
staff perceived as exacerbating incontinence, including incompetent anal sphincter muscle (n=1), prostate cancer (1), morbid obesity (1) and narcolepsy (1).

Table 4.2 : Characteristics of residents (n=15)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years, $\bar{x}$ (range)</td>
<td>84.73 (71-98)</td>
</tr>
<tr>
<td>Women, n (%)</td>
<td>13 (86.6)</td>
</tr>
<tr>
<td>Time since admission in months, $\bar{x}$ (median, range)</td>
<td>31.93, (26.0, 1-97)</td>
</tr>
<tr>
<td>Dementia diagnosis, n (%)</td>
<td>Unspecified dementia 7 (46.0)</td>
</tr>
<tr>
<td></td>
<td>Alzheimer's Disease 6 (40.0)</td>
</tr>
<tr>
<td></td>
<td>Vascular dementia 1 (6.6)</td>
</tr>
<tr>
<td></td>
<td>Parkinsonian dementia 1 (6.6)</td>
</tr>
<tr>
<td>Co-morbidities, n (%)</td>
<td>Depression 8 (57.0)</td>
</tr>
<tr>
<td></td>
<td>Gait disorder (including polio, lower limb oedema, history of falls) 8 (57.0)</td>
</tr>
<tr>
<td></td>
<td>Cardiovascular disease 5 (36.0)</td>
</tr>
<tr>
<td></td>
<td>Musculo-skeletal pathology 5 (36.0)</td>
</tr>
<tr>
<td></td>
<td>Gastrointestinal condition 5 (36.0)</td>
</tr>
<tr>
<td></td>
<td>Hearing or vision loss (greater than expected age related impairment) 5 (36.0)</td>
</tr>
<tr>
<td></td>
<td>Hypertension 4 (28.0)</td>
</tr>
<tr>
<td></td>
<td>Anxiety 3 (21.0)</td>
</tr>
<tr>
<td></td>
<td>Paranoia, phobia 2 (14.0)</td>
</tr>
<tr>
<td></td>
<td>Personality disorder 1 (14.0)</td>
</tr>
<tr>
<td>Mobility, n (%)</td>
<td>Independent 1 (14.0)</td>
</tr>
<tr>
<td></td>
<td>Independent with mobility aid 4 (28.0)</td>
</tr>
<tr>
<td></td>
<td>1 or 2 person assist with transfers 10 (66.6)</td>
</tr>
</tbody>
</table>

**Toileting status**

Six aspects of toileting ability were assessed by the 2 staff who knew the resident best. No resident was independent in any aspect of toilet use. All 15 residents required supervision or physical assistance by staff. All residents were physically assisted by staff to clean after voiding bladder or bowels and the majority required assistance in managing clothing. Results are presented in Table 4.3 :Staff rated toileting ability of residents (n=15).

For all 15 residents, strategies to manage incontinence were the use of incontinence pads, regularly scheduled visits to the toilet and absorbent bedding materials.
Table 4.3: Staff rated toileting ability of residents (n=15)

<table>
<thead>
<tr>
<th>Aspect of toileting ability</th>
<th>Type of staff assistance required</th>
<th>Supervision</th>
<th>Physical assistance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Undress</td>
<td>5 (33)</td>
<td>10 (66)</td>
<td></td>
</tr>
<tr>
<td>Position on toilet</td>
<td>6 (40)</td>
<td>9 (60)</td>
<td></td>
</tr>
<tr>
<td>Wipe perineum</td>
<td>0 (0)</td>
<td>15 (100)</td>
<td></td>
</tr>
<tr>
<td>Wipe perianal area</td>
<td>0 (0)</td>
<td>15 (100)</td>
<td></td>
</tr>
<tr>
<td>Redress</td>
<td>2 (13)</td>
<td>13 (86)</td>
<td></td>
</tr>
<tr>
<td>Wash hands</td>
<td>6 (40)</td>
<td>9 (60)</td>
<td></td>
</tr>
</tbody>
</table>

**Reason for referral to study**

Staff responses to an open-ended question asking for reasons for referring residents to the study were: to assist clean up after an episode of incontinence (n=13); to reduce risk of urinary tract infections (5); inability of the resident to wipe correctly (5); improve odour associated with incontinence (4); reduce vaginal discharge (of unknown cause) (3); reduce staff difficulty in cleaning due to excess body hair or obesity (3); assisting managing constipation (2); assisting management of diarrhoea (2); and agitation during toileting (1).

**Staff**

Sixteen clinical and care staff participated, 2 registered nurses and 14 assistants in nursing, comprising the entire staff team rostered in the study unit of the ACH. No staff declined to participate. The facility handyman and accountant participated in interviews. All staff provided informed consent and no staff withdrew from the study.

**4.3.2 Outcomes**

**Resident acceptance of bidet**

Bidets were used with residents for between 21 and 97 days. Variation in days of use was due to the differing date of their commencement in the study. Acceptance of the bidet
improved for all residents, with the median and modal acceptance score rising from 1 to 5, regardless of the number of days using the bidet. Results are presented at Table 4.4.

Table 4.4: Staff rating of residents’ acceptance of the bidet (n=15)

<table>
<thead>
<tr>
<th>Participant</th>
<th>Likert rating start</th>
<th>Likert rating end</th>
<th>Duration of bidet use in days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>5</td>
<td>96</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>5</td>
<td>97</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
<td>97</td>
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<tr>
<td>4</td>
<td>3</td>
<td>5</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>4</td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>4</td>
<td>99</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>5</td>
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</tr>
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<td>8</td>
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<tr>
<td>14</td>
<td>2</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td>5</td>
<td>47</td>
</tr>
</tbody>
</table>

Median, mode 1, 1 5, 5 Range (21-97)

Key: Response options for Likert rating of observed acceptance of bidet
1. Appeared to dislike experience eg. tried to leave; shouts or distressed
2. A level of discomfort with the experience eg. initial surprised reaction; did not appear happy, but ‘put up’ with experience; did not attempt to leave
3. Could not tell if the resident liked the experience or not eg. no change in expression, body language or vocalisation
4. A level of acceptance of the experience eg. initial surprised reaction but settled into experience; appeared unconcerned once settled
5. Fully accepting of experience eg. appeared to enjoy experience or obvious feeling of benefit

In focus groups, staff corroborated this result, stating that residents quickly became accustomed to the bidet, however they felt becoming comfortable with the bidet was primarily based on staff’s ability to support the resident effectively, especially during initial experiences:

“You just have to take it really slow and explain what you’re going to do”

(Participant 4, assistant in nursing)

Over the course of the study some residents continued to react with surprise as the bidet started, however quickly settled in to the experience:
“yeah, even when you explain you still get that ‘oooh’ (demonstrates with a sharp intake of breath). They go... “It’s cold, it’s cold... oh no, ... it’s nice...”

(Participant 5, assistant in nursing)

Over time, some residents, even with very poor expressive verbal abilities indicated to staff that they wanted the bidet turned on:

“I’ve found that some of the residents... they actually ask for it which is really surprising. Some of them actually look forward to it – and they don't mind it....”

(Participant 3, assistant in nursing)

**Time spent in toileting**

Average time spent in toileting activities is presented in Table 4.5. Compared with usual care, there was a slight increase in average time immediately post installation (+1:03 minutes : seconds), but an overall decrease (-0:50 minutes : seconds) at 12 weeks. Staff stated that it initially took some time to become familiar with the operation of the bidet and individualise the way the bidet was used for each resident.

Table 4.5 : Time spent in usual toileting vs. bidet. (n=7)

<table>
<thead>
<tr>
<th></th>
<th>Number of toileting episodes</th>
<th>Mean time spent in toileting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mins : seconds</td>
<td></td>
</tr>
<tr>
<td>One week prior to bidet installation</td>
<td>34</td>
<td>05:53</td>
</tr>
<tr>
<td>Immediately post bidet installation</td>
<td>146</td>
<td>06:56</td>
</tr>
<tr>
<td>12 weeks post bidet installation</td>
<td>29</td>
<td>05:03</td>
</tr>
</tbody>
</table>

Staff expressed that while there was little meaningful variation in time taken between usual wiping and bidet conditions, there were other changes that saved staff time. Staff explained that the use of the bidet appeared to prompt a void of bladder or bowels, either through ‘starting things off’ or encouraging a more complete emptying of bladder or bowel,
through repeating the running of the bidet wash programme. Staff reported the effects of prompting voiding bladder or bowels resulted in fewer episodes of incontinence, resulting in fewer pad changes or half-showers between scheduled visits to the toilet. The overall reduction of incontinence related tasks appeared to reduce staffs’ sense of being time-pressured and improved the quality of care.

Participant 5: So, now, we were struggling for ages... We need an extra person, now with the bidets it is just a lot easier, we are not doing as many showers... It's quicker, we getting things done on time...

Participant 1: So people aren't waiting to be toileted.

Participant 5: Yeah, yeah, so they're not being incontinent before you get there, because you're behind with someone else, you know what I mean? and I'm not finding we need a third person, (an additional staff member) I'm not stressed about..."(Manager name), we need a third person!"

Interviewer: You're feeling slightly less pressured at work?

Participant 5: Yeah, Yeah, I don't feel like the residents are being neglected now because we weren't getting around to toileting all of them like we should, but now we are, yeah, like there's more time to do it...

Ability of the bidet to clean and dry

The bidet was rated as cleaning successfully in the majority of cases. Success regarding drying was not recorded as this function was abandoned by staff early in the study. Staff felt the drying function ‘took too long’ for either the staff to wait or the resident to remain seated. In addition, the requirement to assess efficacy of cleaning using the bidet by using ‘pat down’ with toilet paper, which also dried the resident, was felt to make the drying function redundant. Results are presented in Table 4.6.

In a total of 291 episodes where a void of bladder or bowels was obtained during the toilet visit, staff rated the bidet as the only method of cleaning required in about three-quarters of cases. For 335 episodes where the resident had been incontinent of faeces prior to the toilet visit, the bidet was the only method required to adequately clean in just over half (53%) of cases.

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Table 4.6: Success of bidet cleaning after voiding over 1,490 episodes of bidet use (n=15)

<table>
<thead>
<tr>
<th>At toilet visit</th>
<th>Void faeces</th>
<th>Void urine</th>
<th>Plus void urine or faeces</th>
<th>Plus void urine</th>
<th>Plus void faeces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of episodes, n</td>
<td>65</td>
<td>226</td>
<td>335</td>
<td>632</td>
<td>297</td>
</tr>
<tr>
<td>Clean with bidet only %</td>
<td>74</td>
<td>77</td>
<td>53</td>
<td>80</td>
<td>74</td>
</tr>
<tr>
<td>Additional wipe needed %</td>
<td>23</td>
<td>4</td>
<td>35</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Additional half shower needed * %</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Missing %</td>
<td>3</td>
<td>19</td>
<td>8</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>Total %</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

* Half-shower - shower the lower half of the body.

At first, some staff were reluctant to use the bidet, claiming they felt the bidet would not clean the extent of the required area. The requirement to rate cleaning ability appeared to prompt these staff to use the bidet and more accurately appraise its ability to clean:

Interviewer: (to participant) what was your ‘aha!’ moment?... because I know that you were really not very happy (with the bidet at first). What turned you around?

Participant: ...I have to admit there are times that I just wasn't doing the paperwork but then I thought I suppose I had better or (staff champion name) will shoot me! .... So I thought I’d better start using it. So I tried it with (resident name) and was rolling my eyes around going ‘yeah, yeah’ and he was really quite bad (soiled after a bowel movement) ...usually it takes ages to clean him up or I have to do a half shower, I just had to get the toilet paper and do a couple of wipes, because it was all moist then, and I thought, okay, that was easy. I just started to get more enthusiastic about it (the bidet) and you could just see how clean they were, like, really clean.

(Participant 5, assistant in nursing).

Staff commented how some residents, despite their dementia, intuitively appeared to understand the bidet and reacted to suit themselves. One experience was described as:

Participant 2: He was manoeuvring himself on it...

Participant 5: So we called him “the surfer”...
Participant 1: But I tell you what, he always had a good clean. Because he's actually got, shall we say, a recessed anus - it actually goes right in - so to clean him properly was quite difficult...

Participant 5: ...But with his surfing he'd move forward
Interviewer: Did he do this spontaneously?
Participant 1: Yes. That was all of his own accord (general agreement).

Behaviours of concern during post voiding cleaning

Seven residents had data recorded on behaviours of concern associated with cleaning both pre- and post-introduction of the bidet. An average of only 5 observations were made for each resident pre-bidet installation compared to an average of 198 with bidet. Table 4.6 presents raw data and percentages for observations. Further statistical testing was not conducted due to the inequality in number of observations and small sample size.

Staff did not encounter any behaviour of concern around two-thirds of the time in the pre-bidet condition compared to three-quarters of the time with bidet. Behaviours associated with toileting appeared to be relatively consistent across individual residents, that is, those residents who usually had behaviours associated with toileting continued regardless of bidet use. Percentage wise, physical and verbal behaviour appeared to decrease when using the bidet.

Staff indicated that it was difficult to differentiate behaviour associated with manual or bidet cleaning from the whole process of toileting, stating that, for example, distress associated with being undressed may persist through the whole toileting procedure. However, staff also stated that they used the bidet as a way to help calm agitated residents:

Participant 3: (Resident name) she gets behavioural when she is incontinent. (General agreement... yes, yeah) so you go and put her on there (the bidet) and then she'll settle...

Participant 2: Yes, she likes to be kept clean.

Interviewer: (concerning behaviour) Are there times that you would say "look, we'll bypass the bidet because it doesn't work in this situation"?

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Participant 2: Only if we were toileting someone and that person and that afternoon they might have been ‘off’, you know, they might have been sundowning or something like that, and quite aggressive... Participant 1 interjection... But we’d give it a red hot go though... (All: yes, yes!)... because sometimes it calms them!

Considering behavioural issues associated with toileting more broadly, staff considered the thermostatically controlled warm toilet seat as key to encourage those residents who would not normally remain sitting on the toilet. One staff described a female resident who, if they could get her on the toilet she would sit on her hands and shout ‘no, no, no, I don't want to!’ After the installation of the bidet:

Participant 2: “she doesn't sit on her hands any more, well not for us, if you get the seat warm...she loves it, the hands come away, and she'll sit”

Participant 1: “and relaxes (her) and that might actually help (void)

(Participants 1 and 2 assistants in nursing)
Table 4.7: Behaviours of concern pre and post bidet intervention (n=7)

<table>
<thead>
<tr>
<th>Resident ID</th>
<th>observations per resident (n)</th>
<th>No behaviour n, (%)</th>
<th>Behaviours of concern (BoC) n, (%)</th>
<th>observations per resident (n)</th>
<th>No behaviour n, (%)</th>
<th>Behaviours of concern (BoC) n, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Verbal only</td>
<td>Physical and verbal</td>
<td></td>
<td>Verbal only</td>
<td>Physical and verbal</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>4 (80.0)</td>
<td>1 (20.0)</td>
<td>290</td>
<td>7 (2.4)</td>
<td>12 (4.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19 (6.4)</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>5 (100)</td>
<td>0 (0.0)</td>
<td>261</td>
<td>48 (18.4)</td>
<td>6 (2.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>54 (20.7)</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>4 (100)</td>
<td>0 (0.0)</td>
<td>264</td>
<td>7 (2.6)</td>
<td>20 (0.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27 (3.3)</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>4 (66.6)</td>
<td>2 (33.3)</td>
<td>131</td>
<td>18 (13.7)</td>
<td>3 (2.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21 (16.0)</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>2 (28.6)</td>
<td>5 (71.4)</td>
<td>178</td>
<td>60 (33.7)</td>
<td>68 (38.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>128 (71.9)</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>4 (66.6)</td>
<td>2 (33.3)</td>
<td>211</td>
<td>53 (25.1)</td>
<td>23 (10.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>76 (36.0)</td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td>1 (20.0)</td>
<td>4 (80.0)</td>
<td>52</td>
<td>12 (2.0)</td>
<td>1 (1.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>39 (75)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40 (77.0)</td>
</tr>
<tr>
<td>Total n</td>
<td>38 (x̅5.4)</td>
<td>24 (63.1)</td>
<td>5 (13.1)</td>
<td>1387 (x̅198.1)</td>
<td>1040 (74.9)</td>
<td>194 (14.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9 (23.7)</td>
<td></td>
<td></td>
<td>151 (10.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14 (36.8)</td>
<td></td>
<td></td>
<td>365 (26.3)</td>
</tr>
</tbody>
</table>

Notes: Only residents with pre- and post-observations included
Missing data was scored as ‘no behaviour’
**Staff physical strain**

Physical strain was rated 504 times by sixteen staff. Using the bidet for resident cleaning was rated as ‘comfortable’ 84.1% of the time, that is, it was not a physically demanding experience for the majority of the time. Results are presented in Table 4.7.

Table 4.8: Staff perceived physical strain using bidet with residents. (n=16)

<table>
<thead>
<tr>
<th>Rating of degree of physical strain</th>
<th>Responses n, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfortable</td>
<td>424 (84.1)</td>
</tr>
<tr>
<td>Muscle strain</td>
<td>24 (4.8)</td>
</tr>
<tr>
<td>Muscle tension</td>
<td>33 (6.5)</td>
</tr>
<tr>
<td>Twisting</td>
<td>23 (4.6)</td>
</tr>
<tr>
<td>Total staff responses</td>
<td>504 (100.0)</td>
</tr>
</tbody>
</table>

This scale had a large amount of missing data. In focus groups, staff reported that it was difficult to differentiate bidet use from the physicality of assisting the resident through the entire toileting process, however staff repeatedly referred to the bidet as ‘saving our backs’.

“(The bidet) is a lot easier on our backs. We’re not bending as far or pulling the resident as much....I really found my back being a lot better.... Once a person had been washed (with the bidet) I wasn’t bending down trying to have the shower hose, a face washer to clean them, struggling to try to hold them in one position so they didn’t fall over....”

(Participant 2, assistant in nursing).

“...the bidet stops and (resident’s) ready to get up. So not only is this a good thing because you used to physically have to pull (resident) up, now she's ready to get up on her own. So there- you’re saving your back again”.

(Participant 1, assistant in nursing).

**Costs**

During the 12-week intervention, total facility expenditure on incontinence pads for the 84-bed ACH decreased by $A1821 compared to the preceding 12-weeks, and by $A2198 (average $A2009) compared with the same period of the previous financial year. No gastric related illness outbreak (which may have included diarrhoea) was documented during these financial reporting periods which may have affected the number of incontinence pads used.

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Days of respite were also calculated during these time periods and compared, as respite (i.e. short-stay) residents bring in their own their own incontinence products compared to permanent residents who have all incontinence products paid for by the ACH. There was negligible difference in respite days used: 342 respite days were used in the study year compared with 355 in the preceding year.

**Staff perceptions of utility**

The facility maintenance manager stated that installation of bidets was routine, no maintenance or cleaning issues were reported throughout the 12-week intervention. No change to facility costs associated with water or electricity usage was observed.

In focus groups staff reflected more broadly on effects of the bidet. A theme that arose was the reduction of odour associated with urine, both for individual residents and in the general environment. One staff commented:

“(in the morning) I just noticed that the pads before, they were always heavy, dark, smelly… Now they were just … clean… even though they are heavy, they are really …clean, and they don't smell”

*(Participant 5, assistant in nursing).*

Another staff commented that the change was so noticeable it was possible to tell which resident had a bidet when tying off plastic garbage bags that contained used incontinence pads:

“You know, when you’re going to tie the garbage bag off… (Interjection “It doesn’t smell!”) you can tell who’s not got a bidet (general agreement “yes”, “yeah”)...straight away, by the smell!”

*(Participants 2 and 5, assistants in nursing).*

A common experience reported was that the bidet appeared to prompt a more complete void of the bladder or the bowels:
“We sit someone on the toilet and we know they have not had their bowels open, we will run it sometimes and most times when it has been run for a bit, around their bottom area, it can actually help them go.”

(Participant 5, assistant in nursing).

Using the bidet to prompt voiding appeared to precipitate a sequence of events that supported an overall reduction in staff workload, especially associated with reduction of episodes of faecal incontinence. Less incontinence reduced need for cleaning and changing of incontinence pads.

“It’s gotten easier with the bidet because we used to have to do at least three of four showers at night, the faecal incontinence was that bad… we hardly do them (showers) anymore”… “yes, I was just saying we would use less pads… we’d (previously) have to go and get spares. We are definitely using less.”

(Participants 4 and 5, assistants in nursing)

There was an expectation amongst some staff that the bidet would address recurrent urinary tract infection (UTI). Five of 16 staff indicated this when providing reasons for referral of residents to the study. While data was not collected on incidence of UTI, senior staff were of the opinion that UTIs had decreased:

“What we are finding in (unit) as you know, they’re (UTIs) just not there.”

(RN 1)

4.3.3 Feasibility of measures

Feasibility of data gathering measures were addressed with staff, focussing on acceptability, practicality and implementation of measures. Accurate assessment of missing data was not attempted due to study resource constraints.

Acceptance of bidet by resident scale: The acceptance Likert scale was reported to be time efficient, easy to understand and score. Having two staff from different shifts rate
acceptance was considered advantageous as resident mood could change over the 24-hour period, resulting in different challenges for different shifts.

**Timing of toileting activities:** Toileting was timed on entering and leaving the bathroom. Staff compliance with this measure was poor. Initially, staff felt timing toileting was an imposition with their already busy workloads:

“... you have to rinse your hands before you touch the pen and the paper gets wet...you forget to turn the stopwatch off. Like, it was just... yeah... sometimes I would forget to fill it out and sometimes I thought... ‘I’m not bothering with this’.

*(Participant 4, assistant in nursing)*.

Other staff felt that the variety of tasks undertaken when toileting a resident such as changing out of nightwear in the morning, invalidated the measure:

“I think the stop watching was a waste of time personally, because the bidet runs for a certain time... In the morning it was never correct because we change them on the toilet while we were doing it (bidet), in the afternoon it was never correct because we changed them back out of their clothes...”

*(Participant 2, Assistant in nursing)*.

**Cleaning and drying rating:** Staff indicated the rating scale was straightforward. The requirement to ‘pat down’ to check completeness of cleaning, which effectively dried the resident, resulted in abandonment of the warm air dryer function early in the study.

**Behaviours of concern:** This measure was intended to capture behavioural reactions of residents when the bidet was operating. Staff stated that it was difficult to differentiate behaviours that may occur while the bidet was in use from behaviours that may be a response to the overall process of toileting.

**Staff physical strain:** this scale was developed in consultation with staff, however in practice they stated they found the terminology difficult to interpret.

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4.4 Discussion

This study aimed to examine the feasibility of the electronic toilet top bidet for use by staff for residents living with dementia in an Australian aged care home. The acceptance of the bidet by both residents and staff, its efficacy in post voiding cleaning, and the practicalities of installation and implementation were explored, as well as the feasibility of data gathering tools for use in this context with these populations.

These preliminary results indicate the bidet is feasible in Australian aged care settings. The bidet was acceptable to both residents and staff, it cleaned effectively in over half of cases (53%) after incontinence of faeces and in the majority of cases (70%) after a bowel motion at the toilet. This is slightly higher than previously reported in a US study, where 49% of 284 bidet assisted toileting episodes were reported as ‘clean’, however in this study there was no attempt to classify the type of void or whether there was incontinence prior to the toilet visit [20].

The bidet was reported to reduce the physical effort associated with post voiding cleaning for staff. No adverse effects, for staff or residents were reported. Installation was routine and the bidet performed reliably. Staff noted additional benefits of the bidet, including a reduction of incontinence associated odour and the ability of the bidet to ‘prompt’ a void. Warm water streams from electronic bidets have been reported to relax the anal sphincter muscle and stimulate peristalsis of the bowel [24, 25] and this effect was used by staff to assist residents open their bowels, especially for those with dementia who had limited understanding of what they were expected to do when seated on the toilet. Staff indicated that this effect of the bidet resulted in the reduction of the number of episodes of incontinence, and consequently, the number of incontinence pads used and the need for additional showering to clean after incontinence, thus reducing their workload. The use of the bidet did not appear to increase
behaviours of concern associated with toileting and for some individuals it appeared to reduce the likelihood of distress.

For data gathering, measures of acceptance and cleaning were considered by staff as practical, however measures of assessing resident behaviour and staff workload require refinement.

The study was designed to run for 12 weeks, with one week of data gathering on aspects of usual toileting care, conducted prior to the intervention. The study was dependent on the willingness of the staff to use the bidet with residents. Despite obtaining the support of the host organisation’s management, the bidet was initially rejected by assistants in nursing. After trialling a bidet installed in the staff toilet, some staff developed the perception that “it won’t work” for the resident. The water stream was considered too narrow to effectively clean, particularly after faecal incontinence. In addition, the requested data gathering was considered by the assistants in nursing to be onerous. This significantly delayed the commencement of the study. An unanticipated outcome of the delay was that some staff independently trialled residents they considered difficult to toilet on the bidet equipped staff toilet, as the staff toilet was adjacent to a training room where weekend resident activities were held. Anecdotal reports of positive experiences with the bidet, as well as negotiating baseline toileting data being reduced to two days, rather than the intended week, provided the catalyst to recommence the study.

This situation demonstrates the central role staff perception has in the adoption of novel assistive technology in aged care settings. The introduction and sustained use of new assistive technologies in long-term care has been acknowledged as problematic for over a decade, with lack of information about technologies, lack of knowledge of implementation strategies within the workplace, regulatory inconsistencies and financial concerns also being mitigating factors.

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against innovation [26]. In addition, theoretical models of technology usage for people with disability are currently underdeveloped and have focussed on the interaction of technology with the end user [27, 28] whereas in this study initial use was dependent on uptake by paid carers. There is scant literature on assistive technology being used primarily by carers, and that which is available has focussed on the family caregiver in community settings [29, 30].

Key factors that led to the recommencement of the study appeared to be trialability, re-invention and the presence of change agents: three of seven factors described by Rogers’ Diffusions of Innovation theory Rogers [31] which describes the adoption and spread of new techniques or products. During the hiatus in study commencement, the ability to trial the bidet allowed time for staff to make up their own minds about potential advantages of the bidet. Those who saw advantage appeared to become ‘change agents’, that is key influencers of their peers. Re-invention is the extent to which a technology can be adapted. In this case the bidet appeared to promote the favourable adaptation of work processes. For example, staff shared their experiences of using the bidet not simply as a technology to clean after voiding, but as an adjunct technique to manage incontinence.

The resulting change in toileting practice has been adopted by staff as an ongoing change in practice. -Informal follow up at 1- and 2-years after the initial intervention indicated that bidets continue to be in daily use in the study unit.

4.4.1 Limitations and strengths

The study was not controlled and participants were not randomised. Results cannot be used as a confirmation of benefit of the bidet over usual care, nor can generalisability be assumed. There is the risk of results being attributable to a Hawthorne type effect, where simply taking part in the intervention was responsible for a proportion of the outcomes [32].

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With regards to feasibility, the study has ecological validity, being conducted over an extended period with usual staff and staffing levels, in an Australian ACH. The use of mixed methods fostered a more complete understanding of the adoption and use of this novel technology.

4.5 Conclusions

The bidet was acceptable for the majority of residents, staff and management. It cleaned effectively in over half of all cases of faecal incontinence, and around three quarters of cases of voiding at the toilet. The bidet was implementable through retrofit into an Australian ACH and the technology was robust and reliable.

These preliminary positive results and lack of adverse events suggest that the bidet is suitable for a larger controlled trial, but more efficient and suitable methods for assessing staff strain, workload and effects on resident behaviour are required.

4.5.1 Implications for clinical practice

Although preliminary results, this study suggests that the bidet presents an opportunity for improving the dignity of residents with significant cognitive and functional impairments, as well as reducing staff strain and additional tasks associated with toileting activities. The use of the bidet to prompt voiding and potential to reduce urinary tract infection merits further investigation as a possible improvement to scheduled toileting incontinence management programs and resident health.

Acknowledgements

We wish to extend our thanks to the residents and staff of HammondCare, Woy Woy, NSW for participating in this study and to The Bidet Shop, Gold Coast, Qld for providing

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training and painting of the toilet seats. This study was funded by the Dementia Collaborative Research Centre, Assessment and Better Care at the University of NSW.
4.6 References


Chapter 5 A controlled, clinical utility, pilot study of the effects of the bidet on Australian nursing home residents and staff

5.1 Introduction

The pilot study described in this chapter leverages from family carer interviews (Chapter 3) and the feasibility study (Chapter 4) and comprises phase three of this work. As the next iteration of this work. It tests if design, methods and procedures are suitable for a future randomized controlled trial [1]. As a pilot study, it is designed as a pragmatic, non-randomised, controlled study. It investigates the clinical utility of the electronic toilet-top bidet and further explores anecdotal claims attributed to this assistive technology. The purpose of the study is to determine if the toilet-top bidet will improve the toileting experience for aged care residents and have greater benefits for staff in Australian aged care homes (ACHs) than current, usual manual post-voiding care practices.

The key research question underpinning this study is "what is the clinical utility of the electronic bidet?" Clinical utility is an increasingly used concept in the assessment of the usefulness, clinical and economic effectiveness of new technologies or interventions [2]. Clinical utility studies operate in routine, everyday practice settings and consider the viewpoints of a range of stakeholders. In this study stakeholders comprise residents, staff, managers, capital works and maintenance personnel in ACHs.

5.1.1 Summary of previous findings

Feasibility

The findings from Chapters 3 and 4 of this body of work indicated that the electronic bidet is feasible for use with the majority older people dependent in self-care after toileting.

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Older people were in general, accepting of the bidet. However, for people living with cognitive decline, acceptance appeared predicated on the staff or family carer being able to effectively support the older person through the experience, particularly initial experiences of the bidet. Adequate support appeared to require knowledge of the individual the carer is assisting and being able to operate the bidet appropriately for the circumstances. This underscores the need for comprehensive training of staff prior to using the bidet with residents. Additionally, findings indicated that ongoing use of the bidet may be based on the perception that the bidet was meeting practical and/or symbolic needs of family or staff carers, and that the bidet had relative advantage over usual, manual toileting care.

The bidet was able to be retrofitted onto a variety of toilet pedestals in private homes and a residential care setting. Installation was reported to be routine and ‘wet area’ power points could be supplied to meet regulatory building requirements. No mechanical or electronic faults were reported, and only expected maintenance issues occurred, such as replacing batteries in the bidet remote control. Operationally, the only issue reported was that remote-control units may be removed by people living with dementia and lost.

**Recruitment of residents and staff**

With respect to recruitment for the feasibility study (Chapter 4) all residents or their representatives who were approached consented to participate. There were no reported adverse events, and the only reason residents left the study was being moved to another area of the participating aged care home (ACH) due to increasing care needs. As discussed in Chapter 4, the staff of the feasibility study site initially dismissed the capacity of the bidet to clean and refused to participate on these grounds. Recommencement of the study appeared based on staff having positive experiences while independently trialling the bidet with residents they considered physically or behaviourally difficult to toilet. Subsequently, these staff became
change agents, shifting overall opinion with their peers in favour of the bidet. Trialling, for staff and/or residents may be an important factor in recruiting staff and securing their support for delivering the intervention and collecting data for future studies.

**Outcomes**

As a new area of investigation, there is little previous research to guide what outcomes should be examined and how these could be measured for a residential aged care population. The domains investigated in Chapter 4 were based on family carers’ experiences (reported in Chapter 3) and *apriori* decisions of the researcher. In general, the design of outcome measures was a pragmatic response to what staff, as the principal data collectors, were comfortable with and how much and what type of data they were prepared to collect. Some measures were found to be easy to use, had good compliance and face validity. The resident bidet acceptance Likert scale, and staff-completed bidet cleaning ability scale, in which success was defined by additional actions staff needed to take to ensure the resident was clean, appeared to be effective in obtaining reliable data. Other measures, including staff physical strain, the timing of toileting activities and behaviours of concern during bidet operation were described by staff in focus groups as difficult to interpret or confounded by other variables. Staff stated that the categories on the Guttman scale of physical strain were difficult to interpret, and the behaviours during bidet use scale was considered not valid, as resident behaviour may relate to mood, pain levels or other issue unrelated to the bidet. Timing of toileting activities were also considered to be confounded by a range of factors, such as changing in or out of night clothes when toileting a resident.

Through feasibility, particularly during focus groups, a range of other outcomes were anecdotally reported, some of which were also reported by family carers. These included perceived reduction in the number of urinary tract infections experienced by the dependent...
older person, reduction in incontinence associated odour (for the individual resident and the environment) as well as the observation that the bidet prompted a more complete void of bladder or bowels. The effect of more complete voiding at a toilet visit was attributed by staff to be associated with a number of positive outcomes including, fewer episodes of incontinence, the requirement for fewer incontinence pads, and a decrease in the number of showers that were required to remove faecal or urinary residue on the skin after incontinence.

**Research approach**

Given the nature of the intervention and the aged care home environment in which the bidet is being investigated, a pragmatic or effectiveness approach is appropriate [3]. This approach aims to test effectiveness of an intervention in the sometimes unpredictable and ‘messy’ real world of clinical practice, in order to draw conclusions about an intervention’s usefulness and generalisability to a broad spectrum of people, including clinicians and clients, in a target populations [4]. Pragmatic trials are characterised by simple designs, conducted in diverse settings, with inclusion and exclusion criteria being minimal or not applied, and ‘usual care’ forming comparison groups. They rely on external validity to support results, in contrast to explanatory clinical trials that seek to understand if and why an intervention works under strictly controlled conditions [3, 5, 6]. This study builds upon the previous feasibility work that addressed the question ‘Can this study be done?’ [7] to test a potential study protocol, suitability of outcome measures, appropriateness of data collection methods, and consideration of potential primary and secondary outcomes for a future, appropriately powered, randomised clinical trial [8, 9].

This study aims to:
1. Determine the clinical utility of the bidet in aged care home settings (clinical utility defined as acceptability, appropriateness, accessibility and practicality of the item [2]).

2. Assess feasibility of data gathering methods for outcomes associated with the bidet for suitability of use in the ACH setting.

The study objectives are to:

1. Investigate the impact and acceptability of the bidet for a range of stakeholders, residents, direct care staff and managers of residential aged care;

2. Determine if the bidet cleans adequately after voiding for the majority of toileting episodes;

3. Measure the effects of bidet use on bacterial colonisation in urine, rates of urinary tract infection documented by the ACH, and skin excoriation associated with incontinence;

4. Examine the effect of the bidet on odour associated with incontinence;

5. Compare documented incidence of constipation pre- and post- introduction of bidet;

6. Examine the impact of the bidet on staff workload;

7. Explore the practicality of the bidet and bidet use in an aged care setting;

8. Estimate the changes to the facility cost of incontinence products after the introduction of bidet technology, and

9. Explore staff perceptions relating to the face validity and ease of use of data collection methods.

5.2 Methodology and Methods

5.2.1 Research approach and design considerations

A pragmatic, mixed methods, clinical utility, pilot study methodology was used within a critical realist epistemology [10]. This study used an explanatory mixed methods design
where quantitative data gathering is followed by qualitative methods. Results are then integrated to explain or more fully understand complex phenomena [11, 12]. This mixed methods approach is supported by a critical realist epistemology which espouses that quantitative methods, in general, measure observable events but do not explain causative mechanisms of those events. Using qualitative methods, such as focussed group discussion, allows access to the underlying mechanisms that give rise to empirically observed events, for example understanding why staff use, or do not use, the bidet with residents [13].

Both quantitative and qualitative methods are nested within a clinical utility framework [2]. This framework proposes that any examination of novel health care technology must not only comprise efficacy, that is, if it works, but also account for practitioners’ perspectives through examining how acceptable, appropriate, accessible and practicable an innovation is for daily care practices, that is its effectiveness [2]. This approach expands the International Standards Organisation’s (ISO) usability framework of acceptability, effectiveness and efficiency presented in Chapter 3. ISO criteria focusses on the usability at an individual user level, while Smart’s (2006) clinical utility framework proposes additional criteria that consider operational and regulatory requirements suited to an organisational systems perspective. The four key dimensions of clinical utility are presented in table 5.1 with examples of issues that need to be considered under this framework, in this context.

Table 5.1: A summary of dimensions of clinical utility for the electronic bidet in aged care, modified from Smart, (2006).

<table>
<thead>
<tr>
<th>Dimension of clinical utility</th>
<th>Aspects</th>
<th>Examples of issues for consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptable</td>
<td>For resident For clinician/carer</td>
<td>Are there: Ethical, legal, psychological concerns, cultural or individual preferences about personal care that may affect acceptability?</td>
</tr>
<tr>
<td>Appropriate</td>
<td>Efficacy</td>
<td>What is the evidence base of this intervention?</td>
</tr>
<tr>
<td></td>
<td>Relevance</td>
<td>How does the bidet impact on existing clinical care processes?</td>
</tr>
</tbody>
</table>
### Dimension of clinical utility

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Examples of issues for consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessible</td>
<td>Resource implications</td>
</tr>
<tr>
<td></td>
<td>What is are capital and ongoing costs associated with bidet use?</td>
</tr>
<tr>
<td></td>
<td>Procurement</td>
</tr>
<tr>
<td></td>
<td>What is the: availability of the product; quality and reliability of the product; ease of installation and maintenance?</td>
</tr>
<tr>
<td></td>
<td>What organisational/ regulatory process are required to be navigated for use?</td>
</tr>
<tr>
<td>Practicable</td>
<td>Functional</td>
</tr>
<tr>
<td></td>
<td>How easy are bidets to use and operate?</td>
</tr>
<tr>
<td></td>
<td>Suitability</td>
</tr>
<tr>
<td></td>
<td>Does the bidet adequately perform the task intended?</td>
</tr>
<tr>
<td></td>
<td>Knowledge requirements</td>
</tr>
<tr>
<td></td>
<td>What are staff required to understand to enable use?</td>
</tr>
</tbody>
</table>

### 5.2.2 Ethics and trial registration

Ethical approval for this study was provided by the Human Research Ethics Committee of the University of Sydney (2015/304).

The study was registered with the Australian and New Zealand Clinical Trials Registry, (ANZCTR): 12615000749505.

Site specific approval was required and granted in NSW by the Research Governance Office of the participating aged care provider.

### 5.2.3 Setting

Two Australian Government funded, not-for-profit residential ACHs participated: An 84-place, frail aged and dementia ACH in regional Victoria, and a 20-place dementia-specific wing of a 146-bed ACH in metropolitan NSW. Both ACHs were fully accredited by the Aged Care Quality Agency, a statutory agency of the Australian Government. The study was conducted sequentially, commencing in Victoria in November 2015 and in NSW in March 2016.
5.2.4 Champions

In each ACH, the facility manager identified a ‘champion’ from the clinical or care staff to be the in-house lead and primary contact for the study.

5.2.5 Sampling and consent

Residents

Participants were permanent residents of their ACH. Sampling was non-random. Experience from the previous feasibility study (Chapter 4 of this thesis) had indicated that actively involving staff from the outset of the study was critical for compliance in delivering the intervention and collecting data.

Staff were asked to consider for whom they might like to trial the bidet, focussing on residents with whom they experienced the most difficulty in toileting and clean up after voiding. Randomisation was not attempted, based on the experience of feasibility. Staff were being asked to gather the data and no funds were available to increase staffing levels to mitigate this extra duty. Staff engagement in the study was essential, and their involvement in choice of resident had been demonstrated in feasibility to elicit cooperation with study procedures. Due to the 12-week duration of the study residents who were receiving end-of-life care and not expected to survive were excluded from selection. Sample size was a pragmatic determination and limited by the number of bidets available. Sixteen bidets were purchased by the host organisation in Victoria, and 10 were provided through funding available to the study in NSW.

Staff were asked to nominate the same number of residents with similar mobility and toileting care needs of the bidet group who would comprise a usual care comparison group.
After nomination by staff, residents, or their substitute decision maker, as indicated in their aged care file, were approached by the ACH study champions and invited to participate. Comprehensive study information was provided, indicating that participation was voluntary, no costs would be incurred and no benefit from participation was assured. Those residents or their representatives who agreed returned a signed consent form. In addition, wherever possible verbal assent was also sought from all residents unable to provide written consent.

**Staff**

All staff who would provide care for consenting residents were invited to participate. The ACH champion distributed participant information and consent forms for return by those who agreed.

**5.2.6 Procedure**

**Materials and installation**

Installation was carried out in consultation with maintenance departments of the participating ACHs. Private electrical contractors were briefed on operational requirements by the researcher (MG). In Victoria, the ACH chose to hardwire the electrical connection (i.e. no power point was installed) and a private plumbing contractor installed the bidets. In NSW regulatory compliant, wet area power points were installed and the ACH maintenance manager installed the bidets as per the manufacturer’s instructions.

In NSW the seats of the bidets were coloured with a black plastic bonding paint for compliance with the organisation’s design policy; items essential for residents, such as taps or toilet seats, were required to contrast with their surroundings, to enable people with visual perceptual problems more easily perceive the item. See Figures 5.1 and 5.2 as examples.
Sixteen (16) Coway BA08 bidets were installed in resident’s ensuite bathrooms for the intervention group in Victoria. Seven (7) Coway BA08 Bidets and three (3) Coway BA13 bidets were similarly installed in NSW. The BA13 bidet is identical in operation but has a different design. It was used for compatibility with a specific model of shower-commode chair. Bidets were supplied from The Bidet Shop, Gold Coast Qld, at a bulk purchase cost rate of $A600 per unit (2018 retail cost is $A1,290 per unit). Purchasing arrangements were carried out by the respective purchasing departments of the participating ACHs. In NSW, funds were

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made available for capital expenditure through an Australian Unity Fellowship Award, and in Victoria bidet were purchased directly by the ACH. Remote controls were housed in a ‘tamper proof’ wall mounted fitting, supplied by The Bidet Shop at $A16.50 per fitting (see Fig 5.3). Due to concerns in Victoria that the remote control would be removed and lost by residents with dementia, the remote was installed inside the resident’s bathroom vanity unit on the opposite side of the bathroom to the toilet. In NSW the remote was located on the side of the vanity, adjacent to the toilet.

![Coway BA08 Bidet remote control in ‘tamper-proof’ holder.](image)

The round hole in the middle allows access to an ‘auto-cleanse’ button that provides a pre-programmed 1-minute rear wash and 2-minute dry program.

It was recommended that each ACH install a bidet in a staff toilet. During feasibility, staff reported that having personal experience of the sensation of the bidet assisted in delivering effective support of the resident and greater familiarity with the controls. The NSW ACH installed a bidet in the staff toilet of the intervention unit, while in Victoria staff were permitted to trial a bidet installed in a vacant resident room for 4 days prior to commencement of the study.

Assessment of resident transferring techniques and individual equipment requirements was undertaken prior to the commencement of the study by the physiotherapist and RN

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Champion in Victoria and in NSW by the researcher, an occupational therapist, (MG). Toilet seat raisers and over toilet frames (a free-standing frame around the toilet that provides ‘chair arms’ to support the resident when sitting and standing) appropriate to resident needs were supplied and installed at both sites. In Victoria, existing shower-commode chairs and the bidet were found to be incompatible. A mobile shower-commode chair is a multi-purpose piece of equipment that can be used as a shower or over-toilet chair. A new transfer policy was developed by the ACH physiotherapist and Registered Nurse (RN) requiring the use of a standing or sling lifters for toileting non-ambulant residents, who would have usually been seated on a shower-commode chair. The transfer policy was approved by management and communicated in accordance with new policy directives for the ACH.

**Staff training**

All staff who potentially would work with residents involved in the study were invited to attend a one-hour training session, conducted by one researcher (MG), during their normal working hours. Sessions were repeated in an attempt to capture all relevant staff for training. Session curricula covered the bidet and its operation; introducing and supporting residents through the experience of the bidet; study aims and protocol; and staff involvement in data gathering. The new transferring policy was reinforced in Victoria. A sample training PowerPoint presentation is included at Appendix 4. A demonstration bidet, made available part way through the study on loan from the retailer, was used for staff to familiarise themselves with the operation of the bidet in NSW (Figure 5.4). No conditions, actual or implied, were associated with the use of the loan bidet.
Figure 5.4: Demonstration bidet prepared for staff training.

The bidet is placed on a covered, Perspex water reservoir which allows clear vision of the spray from the retractable nozzles and the air dryer. The remote control and holder are in the foreground. The bidet seat cover is removed for training purposes.

5.2.7 Data collection and measures

This section describes data collection, outcome measures, instruments and instrument development; qualitative techniques used to collect data, the schedule of data collection (presented at Tables 5.2 and 5.3) and analyses applied to particular methods.

Residents- baseline measures

Demographics: The following were collected from the residents’ aged care file: age, gender, date of admission to facility, length of stay in facility, diagnosis of dementia, if present.

Cognition: The Global Deterioration Scale [14] (GDS) was used to assess residents’ cognitive status and function. The GDS comprises descriptions of 7 stages that are characteristic of the progressive loss of function experienced in dementia. Stage 1 indicates no evidence of cognitive decline. Stage 7 indicates very severe cognitive decline and total dependence. The GDS is scored to reflect the highest level of deficit. Deficits not associated with cognitive loss.
Table 5.2 : Schedule of resident data collection.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Measure</th>
<th>Group</th>
<th>Time point</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td>Checklist</td>
<td>Usual care and bidet intervention</td>
<td>Baseline</td>
<td>Resident’s aged care file</td>
</tr>
<tr>
<td>Cognition and dementia severity</td>
<td>Global Deterioration Scale [14]</td>
<td>Usual care and bidet intervention</td>
<td>Baseline</td>
<td>Interview with staff who know the resident the best</td>
</tr>
<tr>
<td>Activities of Daily Living</td>
<td>10-item Modified Barthel Index [15]</td>
<td>Usual care and bidet intervention</td>
<td>Baseline</td>
<td>Interview with staff who know the resident the best</td>
</tr>
<tr>
<td>Continence and toileting status</td>
<td>Checklist modified from the HammondCare Resident Assessment Tool</td>
<td>Usual care and bidet intervention</td>
<td>Baseline</td>
<td>Interview with staff who know the resident the best</td>
</tr>
<tr>
<td>Behaviours of concern during toileting</td>
<td>Checklist modified from the HammondCare Resident Assessment Tool</td>
<td>Usual care and bidet intervention</td>
<td>Baseline Week 12</td>
<td>Interview with staff who know the resident the best</td>
</tr>
<tr>
<td>Incontinence Associated Odour</td>
<td>Incontinence Odour Scale</td>
<td>Usual care and bidet intervention</td>
<td>Baseline Week 12</td>
<td>Completed by staff</td>
</tr>
<tr>
<td>Bidet acceptance</td>
<td>Bidet acceptance 5-item Likert scale</td>
<td>Bidet intervention</td>
<td>Week 1, Week 12</td>
<td>Completed by 2 staff from different shifts</td>
</tr>
<tr>
<td>Skin excoriation</td>
<td>Incontinence Associated Dermatitis scale [16]</td>
<td>Usual care and bidet intervention</td>
<td>Week 1, Week 12</td>
<td>Completed by RN or staff with training in administration of IAD tool Residents’ Aged Care file</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>Frequency of documented UTI Microbiological assessment</td>
<td>Usual care and bidet intervention</td>
<td>Week 12 (file audit)</td>
<td>Residents’ Aged Care file</td>
</tr>
<tr>
<td>Constipation</td>
<td>Checklist</td>
<td>Usual care and bidet intervention</td>
<td>Week 12 (file audit)</td>
<td>Resident’s aged care file</td>
</tr>
<tr>
<td>Cleaning effectiveness</td>
<td>Checklist</td>
<td>Bidet intervention</td>
<td>Week 1, 6 &amp; 12</td>
<td>Staff complete</td>
</tr>
</tbody>
</table>
For example, loss of ability to walk due to trauma, are not rated. The GDS has established reliability [17] and an interclass correlation coefficient for rater consistency of 0.86 (p<.01) and rater agreement of 0.87 (p < .01) [18]. The GDS was administered via semi-structured interview with the staff member who knew the resident the best. Lower scores indicate better cognition.

**Activities of daily living (ADL):** Performance of ADL was measured using the 10-item Modified Barthel Index [15]. This index measures 10 basic ADL being: bowel and bladder continence, toileting, bathing, grooming, dressing, eating, transfers, mobility and use of stairs. The maximum score is 20, higher scores indicate greater independence. Scoring was based on observation of the activities that the resident actually performed over the previous 48 hours. The Index was administered by interview with the staff member who knew the resident the best. The 10-item Modified Barthel Index is reported to have an internal consistency reliability coefficient of 0.90 [19].

**Continence and toileting:** The HammondCare Resident Assessment Tool (HC-RAT) continence and toileting checklist (Unpublished. Used with permission and adapted January, 2015). The HC-RAT checklist is a clinical observational tool developed by an Australian Government approved Aged Care Provider for resident care planning and aged care funding purposes. Staff were asked to observe each resident’s ability regarding toileting and continence status for the week preceding assessment. The HC-RAT was administered by interview with the staff member who knew the resident the best. Six aspects of toileting ability (undress; positioning on toilet; wipe perineum; wipe peri-anal area; redresses; washes hands) were rated as either independent, requiring supervision or prompting, or requiring physical assistance. Closed ended questions ask if there is a history of urinary incontinence, faecal incontinence, constipation, any physical limitations that impact continence, if staff assistance is required.
during toileting, and if continence pads and or absorbent bed sheets are required. The HC-RAT toileting and continence checklist is at Figure 5.5.

![HammondCare-Resident Assessment Tool. Toileting and continence checklist.](image)

**Figure 5.5 : HammondCare-Resident Assessment Tool. Toileting and continence checklist.**

**Residents – outcome measures**

**Behaviour during toileting:** behaviours were assessed by interview with staff who knew the resident the best. Staff were asked to observe any verbal or physical agitation or aggression during toileting in the week preceding assessment. Frequency of behaviours were recorded using a six item Guttman scale from 0=’never’ 1=’occasionally’ 2=’weekly’ 3=’every few days’ 4=’daily’ 5=’several times a day’.

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**Incontinence Associated Odour:** reduction of incontinence associated odour for individuals and the environment was a recurring observation by staff and family during feasibility. No scale to measure odour of this nature could be located. A ‘freshness scale’ was developed to attempt to quantify change in frequency and severity of incontinence associated odour from baseline to 12-weeks post introduction of the bidet. An inductive process to scale development was used. A measure of frequency was adapted from a dementia behaviour scale [20] and severity of odour was rated on a 6-point scale (1=very weak to 6=intolerable) adapted from an assessment of environmental odour [21]. Separate ratings for faecal and urinary-associated odour were recorded at baseline and week 12. Staff who worked frequently with participating residents were asked to be alert to odour associated with the resident over a 2-week period before rating. An example of the scale is at Figure 5.6.
Figure 5.6: Example of the ‘Freshness scale’, measuring frequency and severity of incontinence associated odour.

**Bidet acceptance:** A 5-item Likert scale for staff rating of resident acceptance of the bidet was developed during feasibility and described in chapter 4. Acceptance was rated by 2 staff, one from morning shift and one from an afternoon shift to account for diurnal mood changes which are common in dementia [22]. Any discrepancy in ratings was discussed by objectively describing the behaviour and its intensity in order to reach a consensus score. If consensus could not be reached, ratings were averaged. An example of the Likert scale is at Figure 5.7
Skin excoriation: The Incontinence Associated Dermatitis scale [16, 23] was used to rate damage to perineal skin (also called excoriation) caused by urinary or faecal incontinence. This scale involves visual inspection of the perineum, peri-anal areas, buttocks and lower abdomen and comparison against photographic examples of redness, skin loss and rash. The worst type of skin damage is scored is mapped and scored for 13 defined areas of this part of the body. Scores are summed with a maximum score of 52 (higher is worse). Reliability and validity of IAD have been investigated [16]. Face and content validity were confirmed by 247 nurses at a US national conference. Interclass criterion validity of -0.98 (p=.006) was good and no statistically significant differences were found between different groups of raters (nurses...
and nurse aides) which indicated good inter-rater reliability. In Victoria, the RN champion and in NSW the staff team leader agreed to undertake assessment.

**Urinary tract infections (UTI):** Two measures were employed; frequency of documented UTI and bacterial load in resident urine was microbiologically assessed.

1) Frequency of documented UTIs. UTI was operationally defined as any infection of the urinary tract for which antibiotics were prescribed. Each documented case of UTI was extracted from residents’ aged care file for the 12 weeks preceding and the 12 weeks of the study.

2) Change in bacterial load in urine was assessed by a commercial pathology laboratory at baseline, and weeks 3, 6, 9 and 12 of the study, using the following procedure:

   a) a urine sample was obtained following usual ACH procedures for a ‘clean catch’ urine specimen. For all females and males with cognitive impairment the procedure was:

      i) A sterile slipper pan was placed in the toilet bowl of each resident’s toilet.
      ii) Water was turned off at the cistern so flush will not cause dilution or loss of the specimen.
      iii) When specimen collected it is inspected for any gross contamination. If contamination detected, specimen was discarded.
      iv) Clean specimens are placed sterile specimen jar provided by the pathology lab.
      v) Specimens are de-identified by labelling with a code, then refrigerated prior to collection by pathology courier.

   b) For cognitively intact male residents, a mid-stream urine was obtained by passing a small amount of urine in to the toilet, stopping the urine stream and passing a small amount of urine directly into the specimen jar. Specimens then were processed as per step v. above.

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c) The commercial pathology laboratory conducted microbiological analysis to detect growth of bacteria. The laboratory performed urinalysis according to standardized procedures:

i) Chemistry. Urine samples were tested for chemical constituents using a multiple reagent strip (dipstick) for the following: pH, protein, glucose and blood (haemoglobin and myoglobin).

ii) Microscopy. Cell counts were performed to determine the number of leucocytes (white blood cells) and erythrocytes (red blood cells) present in the sample. The presence of epithelial cells was assessed as 1+, 2+ or 3+ (with 3+ being the highest rating) to provide an indication of the level of genital skin cell contamination.

iii) Culture. Using a standardized loop, 1 microlitre of urine was inoculated onto agar culture plates and incubated at 37°C for 18 to 24 hours. If the uropathogen colony count was 10^6 or greater, bacteria were then identified by routine methods and susceptibility testing of bacteria to common antibiotics was performed. If there was no growth at 24 hours, plates were re-incubated for a further 24 hours.

iv) Susceptibility testing: The following antibiotics were tested routinely: ampicillin, amoxycillin-clavulanate, cephalexin, trimethoprim, nitrofurantoin and norfloxacin.

(Protocol courtesy of Australian Clinical Labs, Consulting Microbiologist [24])

For analyses, two levels of bacterial growth were defined. Asymptomatic bacteriuria (ASB) was operationally defined as all specimens where a specific bacteriological pathogen could not be identified from a growth of mixed organisms. All enteric or mixed specimens were classed as ASB.

Diagnosis of UTI requires both the presence of clinical symptoms and the isolation of bacteria on analysis of urine. As clinical symptoms were not collected in this study, UTI is
operationally defined as probable UTI, where specimens demonstrate growth of a specific bacteria with a white blood cell count greater than $100 \times 10^6/L$ and pathology laboratory testing has indicated presence of red blood cells at any level.

**Constipation:** Constipation was operationally defined as bowels not open for 3 days or more. Three days documentation in each resident aged care file of ‘bowels not open’ (BNO) was standard in both facilities to trigger investigation of constipation by the RN. Number of episodes of constipation were extracted from the residents’ aged care files for the 12 weeks preceding and for the 12 weeks during the study.

**Effectiveness of cleaning with bidet:** Effective cleaning by bidet was defined as no requirement for additional cleaning after bidet use. A ‘pencil and paper’ checklist to record type of void and methods of post voiding cleaning was developed in conjunction with staff during feasibility study (Chapter 4). Effectiveness of cleaning rating sheets were printed and hung on a clipboard in each resident’s ensuite, with a pen attached, to prompt staff completion immediately after each toilet visit. Staff were requested to complete a cleaning checklist by circling the appropriate response in weeks 1,6, and 12 of the study for all episodes of toileting with bidet.

Table 5.3: Example checklist for cleaning after voiding.

<table>
<thead>
<tr>
<th>Resident name:</th>
<th>Date:</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Questions:</strong></td>
<td><strong>Response (Circle one):</strong></td>
<td></td>
</tr>
<tr>
<td>Was the resident incontinent prior to the toilet visit?</td>
<td>no incontinence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>urine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>faeces</td>
<td></td>
</tr>
<tr>
<td></td>
<td>both</td>
<td></td>
</tr>
<tr>
<td>What type of void was obtained at this toilet visit?</td>
<td>none</td>
<td></td>
</tr>
<tr>
<td></td>
<td>urine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>faeces</td>
<td></td>
</tr>
<tr>
<td></td>
<td>both</td>
<td></td>
</tr>
<tr>
<td>Was the bidet effective in cleaning?</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>If no, was other cleaning required?</td>
<td>additional wipe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>‘half’ shower</td>
<td></td>
</tr>
</tbody>
</table>

Meredith Gresham
Staff

The schedule of staff data collection is presented at Table 5.4.

**Demographics:** A self-report survey was given to all staff at baseline recording: age, gender, highest educational qualification (in any field), current work role at age care facility, duration of employment at current facility, in months, duration of work in any capacity in aged care, in months.

Table 5.4 : Schedule of staff data collection

<table>
<thead>
<tr>
<th>Domain</th>
<th>Measure</th>
<th>Data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Time point</td>
</tr>
<tr>
<td>Demographics</td>
<td>Checklist</td>
<td>Baseline</td>
</tr>
<tr>
<td>Workload</td>
<td>Expectation of change in workload Likert scale</td>
<td>Baseline</td>
</tr>
<tr>
<td></td>
<td>Perceived change in workload Likert scale</td>
<td>Week 12</td>
</tr>
<tr>
<td></td>
<td>NASA Task Load Index [25]</td>
<td>Week 12</td>
</tr>
<tr>
<td>Estimation of bidet use</td>
<td>Checklist</td>
<td>Week 12</td>
</tr>
<tr>
<td>use frequency and self-trial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Staff expectations of bidet:** feasibility had revealed that staff developed opinions about the usefulness of the bidet and its capacity to clean (or not), prior to using the bidet themselves or with residents. A 5-item Likert scale was developed to assess overall staff expectations the bidet. The scale was administered at baseline, immediately after training in bidet operation. Staff were requested to give their opinion about their expectations of the effects of bidet use for residents by choosing one rating from 1= “I think it will be a waste of time” to 5= “I think it will be great and make a positive difference to residents”.

At week 12, the 5-item Likert scale was repeated, with appropriate grammatical tense changes, to assess overall opinion of the bidet by choosing one rating from 1= “I think the bidet was a waste of time”, to 5= “I think it was great and made a positive difference for most residents”. An example of expectations and use of bidet Likert scales for week 12 is at Fig 5.8.

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Figure 5.8: Example of staff use, expectations of the bidet and associated workload week 12 checklist and Likert scales.

**Staff workload:** change in perceived workload associated with clean up after toileting residents was measured using two tools:

1) Pre and post workload change: a 5-item Likert scale administered at baseline measured staff expectations of effects of the bidet on their workload. Staff chose one of five statements graded from 1 = “I think it will be a waste of time” to 5 = “I think it will be great and make a positive difference to my workload”. At week 12, a 5-item Likert scale was given to staff who were asked to give their opinion on change in toileting workload after using the bidet with residents by selecting one of five statements from 1 = “Using the bidet increased staff workload a lot” to 5 = “Using the bidet decreased staff workload a lot”. An example of Week 12 workload change Likert scale is at Fig. 5.8.
2) NASA-Task Load Index (TLX)[25, 26]: As reported in Chapter 4, workload was conceptualised in the feasibility study as a unidimensional rating of physical effort associated with toileting a dependent older person. Physicality was rated on a 4-item Guttman scale. Staff considered this scale difficult to interpret. Further investigation of the literature on nurse workload revealed the NASA Task Load Index (NASA-TLX) [25, 26]. This measure is a multi-dimensional rating of workload, developed for aviation but with a history of being used in health care settings [27]. A review of the use of the NASA-TLX with nurses explored the validity and reliability, finding the NASA-TLX has well established test-retest reliability of 0.77, as well as construct, convergent, discriminant, predictive and concurrent validity [27]. Furthermore, the sensitivity of the NASA-TLX has been shown to discriminate between workload levels [28].

Description: the TLX is a ‘pencil and paper’ subjective rating of workload of defined tasks. The TLX conceptualises workload as multi-dimensional, comprising mental, physical and temporal demands, effort (mental and physical demands combined), perception of quality of performance and frustration level. Each dimension is rated on a 21-interval, bipolar scale from ‘very low’ to ‘very high’, except the performance dimension which is rated from ‘perfect’ to ‘failure’. An example of the NASA-TLX response sheet is at Fig. 5.9
Procedure: Staff participants were given two NASA-TLX rating response sheets in week 12 of the intervention, one for rating bidet assisted toileting care and one for usual, manual post voiding cleaning. The researcher read aloud instructions as per instructions in the NASA-TLX Manual, briefly describing the concept of workload and the how to complete the measure. Definitions of each sub-scale from the NASA-TLX Manual [29] were also read to participants prior to completion of each sub scale.

Participants completed the scale by marking their response which best matched their experience on each of the six sub-scales.
Scoring: Instructions provided in the TLX Pencil and Paper Manual v.1.0 [29] were used. If participants marked between two ticks, the value to the right of the tick was used. In the case of the respondent circling more than one tick, the tick to the right was scored.

Analysis: The “Raw TLX” (RTLX) methods of analysis was used. A median score was calculated for each subscale rating and an overall workload rating was calculated through averaging all subscales [25]. Comparisons were analysed using related samples Wilcoxon signed-rank tests.

Staff experience of bidet use: At week 12, staff completed a survey that asked if they had used the bidet with residents; if so, how often (daily, every couple of days, once or twice a week, a couple of times a month, not at all) and if they had tried the bidet themselves.

Qualitative measures:

1. Focus Groups: During the last week of this 12-week study, four (4) focus group discussions were held, three in Victoria and one in NSW. In Victoria, participants were stratified into groups of assistants-in-nursing and enrolled nurses, and registered nurses and managerial staff. Focus groups were facilitated in Victoria by a member of staff from the host organisation’s research department and co-facilitated by the researcher. In NSW the group was facilitated by the researcher and co-facilitated by a member of the host organisation’s policy and planning unit.

Participation was voluntary, and staff were paid for their time to attend. A semi-structured question schedule to guide focus group was developed using major topics areas that arose during feasibility and pilot studies. The question schedule is presented in Table 5.5. All groups were audio recorded, transcribed verbatim and analysed using line-by-line coding and thematic analysis as described in Chapter 4.
2. **Interviews:** Individual semi-structured interviews, lasting approximately 15 minutes, were conducted with the participating organisations maintenance staff and accountants concerning installation and maintenance issues with the bidets or costs associated with incontinence products for each ACH. Detailed notes were made during interviews, which were added to the thematic analysis of the focus groups.

Table 5.5: Focus group question schedule

<table>
<thead>
<tr>
<th>Focus group sample questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can you tell me about the bidet and what it does?</td>
</tr>
<tr>
<td>How does using the bidet differ from usual care for you?</td>
</tr>
<tr>
<td>What benefits did it the bidet have for you? For the resident?</td>
</tr>
<tr>
<td>Do you feel the bidet is a good idea? For whom? Why?</td>
</tr>
<tr>
<td>How did the bidet change your work routines or ways you work with residents?</td>
</tr>
<tr>
<td>Was the bidet compatible with existing work practices?</td>
</tr>
<tr>
<td>What training did you receive? Was the training adequate?</td>
</tr>
<tr>
<td>What impact has the bidet had on your work overall?</td>
</tr>
<tr>
<td>Have you had any problems during they study with installation, use or maintenance of the bidet?</td>
</tr>
<tr>
<td>How has your opinion of the bidet changed over the study period?</td>
</tr>
<tr>
<td>Can the bidet/use of the bidet be changed or adapted to improve on the toileting experience for residents?</td>
</tr>
<tr>
<td>How?</td>
</tr>
<tr>
<td>Have you had any issues with the data collection you have been asked to complete over the study period?</td>
</tr>
</tbody>
</table>

3. **Field notes:** Field notes were maintained during the study period at each ACH. Field notes included direct quotes from residents, staff and families obtained in person, by email or telephone as well as observations made by the researcher during visits to the ACH during the intervention.

**Approach and analyses**

Analysis of results used a modified intention-to-treat (ITT) approach. Consistent with a pragmatic study, ITT includes data from all participants regardless of whether they completed the study or of the degree of compliance with the intervention [30]. This approach may dilute Meredith Gresham
results due to participants leaving the study or non-compliance with the intervention, but proponents argue that ITT analysis better reflects how the intervention would perform in practical, clinical situations [30, 31].

The Statistical Package for the Social Sciences (SPSS) version 22 (IBM Corporation 2013) was used for analyses and alpha was set at 0.05. Consistent with recommendations for pilot studies primarily descriptive statistics were used [1, 8, 32]. Analysis used frequencies, percentages and comparison of means and medians were analysed using t-tests, chi-squares, Wilcoxon signed-rank and Mann-Whitney tests.

Qualitative data were analysed using inductive content analysis, described in Chapter 4. The aim of qualitative data was to provide detail of the experience of use of the bidet from a variety of perspectives, to explain qualitative results, provide greater insight in to the strengths and limitations of the use of the bidet and examine study design, measurement tools and data collection issues. [33, 34]. Quantitative and qualitative measures were synthesised as described in Chapter 4 [11] and results are presented together under each topic area of the investigation.

5.3 Results

5.3.1 Resident baseline data

Resident recruitment and demographics

Forty-nine residents participated in the study, 32 in Victoria and 17 in New South Wales (NSW). An additional 4 residents had consented to join the study but were moved to a different location to receive a higher level of care prior to study commencement. No data was collected from these residents. During the intervention, 8 residents were discharged from the study; 4
died, 1 commenced end-of-life care, 2 transferred to another ACH and 1 was admitted to a rehabilitation hospital and did not return. In accordance with the intention to treat approach to analysis, all available data were included in analyses. As the sample was non-random, demographic data between usual care and bidet conditions for Victoria and NSW were also compared separately, to determine if there was systematic bias in resident selection. Demographic results for Victoria, NSW and the total sample are presented in Table 5.6.

Table 5.6: Demographic information on participants, n= 49

<table>
<thead>
<tr>
<th>Study site</th>
<th>Victoria¹</th>
<th>NSW²</th>
<th>Total¹²</th>
<th>Test statistic for differences for bidet v. usual care groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>Bidet</td>
<td>Usual care</td>
<td>Bidet</td>
<td>Usual care</td>
</tr>
<tr>
<td>Number of participants (%)</td>
<td>16 (61-96)</td>
<td>16 (53-93)</td>
<td>9 (74-95)</td>
<td>8 (74-93)</td>
</tr>
<tr>
<td>Age Mean (range)</td>
<td>83.44 (61-96)</td>
<td>85.44 (53-93)</td>
<td>87.11 (74-95)</td>
<td>86.25 (74-93)</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>10 (62.5)</td>
<td>13 (81.2)</td>
<td>9 (100)</td>
<td>8 (100)</td>
</tr>
<tr>
<td>Median LoS in months (range)</td>
<td>6.5 (1-96)</td>
<td>14.0 (0-93)</td>
<td>17.0 (1-68)</td>
<td>28.0 (2-62)</td>
</tr>
<tr>
<td>Diagnosis of Dementia (%)</td>
<td>4.88 (1-91)</td>
<td>4.94 (1-65)</td>
<td>6.56 (5-93)</td>
<td>5.93 (3-92)</td>
</tr>
<tr>
<td>Global Deterioration Scale (GDS) mean, SD</td>
<td>7.88 (6.449)</td>
<td>9.25 (5.972)</td>
<td>7.56 (3.00)</td>
<td>13.13 (3.56)</td>
</tr>
<tr>
<td>Barthel's ADL</td>
<td>13 (81.2)</td>
<td>3 (18.75)</td>
<td>0 (0.0)</td>
<td>6 (75.0)</td>
</tr>
<tr>
<td>Urinary incontinence n (%)</td>
<td>10 (62.5)</td>
<td>6 (37.5)</td>
<td>8 (88.8)</td>
<td>3 (37.5)</td>
</tr>
<tr>
<td>Faecal incontinence n (%)</td>
<td>7.88 (6.449)</td>
<td>9.25 (5.972)</td>
<td>7.56 (3.00)</td>
<td>13.13 (3.56)</td>
</tr>
</tbody>
</table>

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Comparing bidet intervention and usual care groups for the total sample, $\chi^2$ tests of independence or independent samples t-tests revealed no significant differences between groups on age, gender, median length of stay at the ACH, diagnosis of dementia, cognitive status as measured by the GDS, function on Barthel’s ADL scale or presence of urinary incontinence. A higher than expected proportion of individuals ($\chi^2 (1)= 7.84, p=.020$) in the bidet group had faecal incontinence.

Comparing bidet intervention and usual care groups in Victoria and NSW ACHs separately, $\chi^2$ tests of independence indicated that in NSW a higher than expected proportion of residents in the bidet intervention group scored lower on Barthel’s ADL scale ($t(15) 3.49, p=.003$), indicating lower levels of functional ability, and had lower cognition scores on the GDS ($t(15) -2.607, p=.020$), however, these effects were not evident when the samples from both states were considered together.

**Baseline continence and toileting status**

Table 5.7 : Baseline continence aid use by residents n=49

<table>
<thead>
<tr>
<th>Group</th>
<th>Continence aids used</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>Pad, ‘pull-ups’</td>
</tr>
<tr>
<td>Usual care, n (%)</td>
<td>6 (25.0)</td>
<td>17 (70.8)</td>
</tr>
<tr>
<td>Bidet, n (%)</td>
<td>2 (8.0)</td>
<td>22 (88.0)</td>
</tr>
<tr>
<td><strong>Total n (%)</strong></td>
<td><strong>8 (100.0)</strong></td>
<td><strong>39 (100.0)</strong></td>
</tr>
</tbody>
</table>

The majority of residents were assessed by ACH staff as requiring incontinence aids. Absorbent pads or ‘pull-ups’ were worn daily by 39 (79.6%) of the sample. Two males required
catheterisation and also used pads due to catheter overflow. Proportions are presented in Table 5.7.

At baseline, of the 6 components of toileting ability measured on the HammondCare RAT, the majority (90%) of the bidet intervention group required physical assistance or supervision in one or more components of toileting, with 23 residents (92%) dependent in cleaning, i.e. unable to wipe after voiding and requiring staff physical assistance. In the usual care group, just under three-quarters (73.5%) of the sample required assistance with wiping after voiding. Results are presented in Table 5.8.

Table 5.8: Baseline resident abilities in toileting activities, bidet (n=25) and usual care groups (n=24)

<table>
<thead>
<tr>
<th>Toileting activity</th>
<th>Bidet group n=25</th>
<th>Usual care n=24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Independent</td>
<td>Supervision</td>
</tr>
<tr>
<td>Undress n (%)</td>
<td>2 (8)</td>
<td>3 (12)</td>
</tr>
<tr>
<td>Position on toilet n (%)</td>
<td>3 (12)</td>
<td>7 (28)</td>
</tr>
<tr>
<td>Wipe perineum n (%)</td>
<td>2 (8)</td>
<td>5 (20)</td>
</tr>
<tr>
<td>Wipe perianal area n (%)</td>
<td>2 (8)</td>
<td>6 (24)</td>
</tr>
<tr>
<td>Redresses n (%)</td>
<td>1 (4)</td>
<td>9 (36)</td>
</tr>
<tr>
<td>Wash hands n (%)</td>
<td>4 (16)</td>
<td>12 (48)</td>
</tr>
<tr>
<td>Proportions (%)</td>
<td>14/150 (9.3)</td>
<td>42/150 (28)</td>
</tr>
</tbody>
</table>

5.3.2 Resident follow up results

Behaviour during toileting

Data on behaviours of concern during toileting were collected for 42 residents in both weeks 1 and 12. Twenty residents were in the bidet intervention group and 22 were in the usual care comparison group.
For the bidet intervention group, pre and post comparison using a Wilcoxon signed-ranks test indicated that the frequency of behaviours of concern during toileting showed a statistically significant decrease at week 12 (Z = -1.756, p < 0.039). For the usual care comparison group, a Wilcoxon signed-ranks test indicated there was no change from week 1 to week 12 in frequency of behaviours of concern during toileting (Z = -0.600, p < 0.270).

To examine the magnitude of behaviour change, the number of residents with positive or negative changes in rank were counted. Behaviours of concern for around half of the sample in each group did not show any change. However, a greater than expected proportion in the bidet group showed improvement, with 8 residents’ behaviour reported to have improved, compared to 2 residents whose behaviours of concern increased. Results are at Table 5.9.

Table 5.9: Number of residents with negative, positive and no change in rank for behaviour associated with toileting.

<table>
<thead>
<tr>
<th>Change in rank sign</th>
<th>Bidet intervention n=20</th>
<th>Usual care control n=22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative rank change (n)</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Positive rank change (n)</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>No change (n)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>22</td>
</tr>
</tbody>
</table>

Notes:
Negative rank change indicates behaviour worsened
Positive rank change indicates behaviour improved

A between groups comparison was made at baseline and week twelve for frequency of behaviours of concern. A Mann-Whitney test indicated that there was no difference between the usual care controls (mean rank 23.96) and intervention group (mean rank 26.0), U=275.0, p=.613. At week 12, a Mann-Whitney test indicated that there was no difference between the usual care controls (mean rank 24.06) and intervention group (mean rank 24.94), U=277.5, p=.415.

Focus group data revealed a more complex and nuanced picture of behaviour associated with staff assisted toileting. Rather than simple positive or negative changes in behaviour when Meredith Gresham
toileting, discussion revealed differences in staff perception of the antecedents of behaviour and some staff indicated that a more global appreciation of behaviour during all personal care tasks was required to place behaviour during toileting in context. Three key themes arose around behaviour; ‘behaviour as the status quo’, ‘taking the line of least resistance’ and ‘giving the resident space’ and are presented below.

‘Behaviour as the status quo’: Behaviours of concern associated with toileting (and personal care in general) were perceived by some staff as a symptom of dementia or an aspect of particular individuals’ personalities. For these staff, behaviours were considered to be stable over time and present regardless of bidet use or not. One Victorian care staff captured this viewpoint by stating “I don't think it’s the bidet, I think it’s any toilet. It’s just his behaviours…” (Carer, Victoria). The reaction of these staff to residents’ behaviours of concern was characterised as simply something that staff needed to cope with in order to carry out their personal care duties. The opinion was if the bidet helped in delivering better personal care, such as cleanliness, it would be worthwhile, regardless of the behaviour it may provoke:

“R, she would be resistive regardless (of using a bidet or not). She’s resistive to you getting her up, attending to her care, brushing her teeth, so even if I turned on the bidet it wouldn't bother me, it wouldn't stress me because she’s going to be resistive anyway, but I know hey, you’re getting a proper wash.”

(Carer, Victoria)

‘Taking the line of least resistance’: Other staff expressed that the bidet was a technique to reduce the behaviours of concern associated with personal care tasks more generally. Staff discussed how they has used to the bidet to reduce the number of full or half showers for residents who found showering particularly distressing. One staff member described how the bidet enabled her to take ‘the line of least resistance’ to complete daily personal care:
“Because most (staff) avoid showering her because she’ll kick you, she’ll bite your finger, she’ll throw water at you, (using the bidet) you’ve saved a bit of time in that regard, that’s just how I see it.”

(Carer, Victoria)

‘Giving the resident space’: The third theme arose around the proposition that behaviours of concern are a response to the invasion of personal space required by manual post-voiding clean-up. The bidet was perceived as a tool to ‘give the resident space’, that is, provide privacy for this intimate activity. ‘Space’ was variously considered as physical or temporal but was brought about through changes in work practice made possible by the bidet.

With regard to providing physical privacy, one staff noted how the bidet prompted both the reduction of physical contact (ie. the need for wiping) as well as privacy in the bathroom:

“….we are right up in their personal space. A lot of people don’t like that. A lot of people prefer to do it themselves, even though they can’t. This (bidet) is giving them, like, space. So, as I said you can sit them on the loo, go out and make a bed, or hang up the clothes, or… do whatever, and umm, leave them in there. I know that when I go to the toilet, I don’t want someone in the toilet with me, fussing over me, trying to clean me, when I’m on the loo and they’re only human too, so it’s exactly the same for them.”

(Carer, NSW)

With regard to temporal ‘space’, other staff expressed sentiments of the group about giving the resident time to void, opposed to the usual rush to get through the task of toileting:

Carer 1: “Well I suppose obviously in our haste to get people on the toilet and off… on the toilet, they void, then you’re quickly up, pad back on and off you go. Actually, they’re not empty, there’s still a lot (of urine or faeces) there to come away, and given the time and the stimulation often of that water coming up underneath, will help them to eliminate even more… I didn’t realise how important it is giving our patients time on the toilet’…So if the bidet means spending a bit more time with them on the toilet, I think it’s fantastic.”

Carer 2: “Yeah, less behaviours, less pad changes, less of the hard work that everyone’s saying there’s too much to do”.

(Carers, Victoria)
Incontinence associated odour

Frequency and severity of incontinence associated odour for the bidet group was measured at baseline and week 12.

For frequency of odour, indicating how often staff considered a resident was malodourous, a related-samples Wilcoxon signed-rank test indicated that there was no change in median rank scores at baseline (mdn=4.00) and week 12 (3.00) (Z = -.590, p=.555). For severity of odour, a related samples Wilcoxon signed-rank test indicated that there was no change at baseline (mdn=3.00) and week 12 (mdn=2.00) in severity of urinary incontinence associated odour (Z= -.029, p = .977), or faecal incontinence associated odour at baseline (mdn=3.00) and week 12 (mdn 3.00) (Z= -.313, p=.754) .

Examining individual changes in rank for severity of odour, about half of the sample had tied ranks at baseline and week 12. Roughly half were reported by staff to have improved odour, and half were worse. Results are presented at Table 5.10.

Table 5.10 : Residents with negative, positive and no change in rank for severity of incontinence associated odour.

<table>
<thead>
<tr>
<th>Change in rank sign</th>
<th>Bidet intervention group n=25</th>
<th>Change in urinary odour baseline-week 12</th>
<th>Change in faecal odour baseline-week 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative rank change (n)</td>
<td>8</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Positive rank change (n)</td>
<td>7</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>No change (n)</td>
<td>10</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Missing (n)</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
Negative rank change indicates odour worsened
Positive rank change indicates odour improved

A between groups comparison was made at baseline and week twelve for severity of odour. A Mann-Whitney test indicated that there was no difference between the usual care

Meredith Gresham
controls (mean rank 23.23) and intervention group (mean rank 26.7), U=257.5, \( p = .198 \). At week 12, a Mann-Whitney test indicated that there was no difference between the usual care controls (mean rank 24.48) and intervention group (mean rank 25.5), U=287.5, \( p = .40 \)

Odour associated with incontinence was not commented upon in focus groups in Victoria. In contrast, staff in NSW were in agreement that residents toileted with the bidet had less incontinence associated odour:

“…And they don't smell. The smelling is gone a lot down. I don't smell the resident. There were some who would smell even after their everyday shower... now I don't smell them, (mmm... nods... indicating agreement from group) even though we don't shower them ...it’s winter and we don't prefer to shower them every single day, alternating day or maybe twice a week, because they don't smell because we are using bidet on them every day (yeah) and that's the part being cleaned.”

(Carer, am shift, NSW)

**Acceptability of the bidet for residents**

Acceptability of the bidet for residents in the intervention group (n=25) was rated by two staff, from different shifts in week 1 and again in week 12. A related samples Wilcoxon signed-rank test indicated that the median rank for week 12 ratings (mdn=10.35) was statistically significantly higher than in week 1 (mdn=7.00) (Z=-3.300, \( p = .001 \)).

Staff comments in focus groups were congruent with an overall improvement in resident acceptance of the bidet. The dominant view was that although the bidet was an ‘unusual’ experience, given support, residents quickly became used to it, even enjoying the sensation.

“...the first time I started trying (bidet) on them... there were some incidents like (participant demonstrates with sharp intake of breath) ... like getting a shock.... But now after 12 weeks, most of them, our residents are used to it, I would say pretty much everybody.... I think they all loved the bidet pretty much.”

(Carer, am shift NSW)
However, staff were clear that acceptance of the bidet by residents was predicated on the effectiveness of support the staff was able to give. Support came in many forms: Some staff used a gentle reassuring touch on the arm or shoulder which also assisted if the resident tried to stand up as the bidet water stream started. Most staff tried to verbally explain what was about to happen, though some found it difficult with residents with very limited receptive communication skills:

“...for her (resident’s) comfort and security I squatted next to her as if I was personally responsible for that jet of water.”

(EN, night shift Vic)

Staff in NSW commented that as they became more familiar with the functions of the bidet, they modified settings in order to improve the experience for residents. Examples given were adjustment of water and seat temperature depending on the ambient temperature, and the modification of functions such as increasing width and reducing pressure of spray for residents with potentially painful conditions, such as haemorrhoids.

Staff reported that the bidet was not accepted by all residents on all occasions, even with support. Non-acceptance appeared to be related to the mood of the resident when taken to the toilet, rather than the bidet itself. Acceptance scores decreased in only one resident between baseline and week 12, from ‘could not tell if the resident liked the experience or not’ to indicate a ‘level of discomfort’. Serendipitously, staff in each state selected one resident who had a history of being actively resistive to being taken to the toilet, (bidet equipped or not) primarily to examine if the bidet might encourage use of the toilet. While the warm seat was credited with assisting some resistive residents to sit on the toilet, and remain there, the presence of the bidet did not prompt resident with a history of active resistance to entering the bathroom or using the toilet:

Meredith Gresham
“There’s only one I’d say that wasn’t successful, but she doesn’t get in the toilet ever, so it’s really hard to judge”

(EN, day shift Vic)

Rates of incontinence associated dermatitis

Of the 25 residents in the bidet group, 16 were assessed at baseline and 13 at week 12 for incontinence associated dermatitis (IAD). No IAD assessment was undertaken in NSW. Baseline and week 12 IAD scores were compared for the bidet group using a related samples Wilcoxon signed-rank test. There was no difference between median baseline ranks (mdn=5.00) and week 12 median ranks (mdn=7.00) (Z=28.0, p=.051).

IAD scores for bidet and usual care groups at baseline and week 12 were compared using a Mann-Whitney test. There were no significant differences in IAD between bidet (mdn=16.72) and usual care group (mdn=16.28) at baseline (U=124.5, p=.888), nor was there any statistically significant differences between bidet (mdn=17.13) and usual care group (mdn=15.88) at week 12 (U=118.0, p=.664).

In Victoria, an audit of residents’ aged care files was conducted to determine number of documented cases of IAD (or perineal skin excoriation) and the use of emollients to protect skin for 12 weeks of the study and the 12 weeks prior. Of the 32 residents, incontinence associated dermatitis was documented for only 2 residents, both in the usual care group. Half of the bidet group (8 of 16 residents) and half of the usual care group (8 of 16 residents) were documented to have application daily of emollients.

Urinary tract infection and bacteria in urine

i. Laboratory results

Meredith Gresham
Out of 176 possible urine tests, 117 (66.5%) were returned. These data are presented in table 5.11. The bidet group were significantly more likely to have a clear case of asymptomatic bacteriuria (ASB) or probable UTI (13/60 bidet intervention samples were a probable UTI compared to 3/57 usual care samples; \( \chi^2 (2) = 7.646, p = .022 \)).

Table 5.11 : Urine specimen results for bidet intervention and usual care control groups

<table>
<thead>
<tr>
<th>Group</th>
<th>No growth detected</th>
<th>Clear case ASB</th>
<th>Probable UTI</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usual care control</td>
<td>34</td>
<td>20</td>
<td>3</td>
<td>57</td>
</tr>
<tr>
<td>Bidet Intervention</td>
<td>25</td>
<td>22</td>
<td>13</td>
<td>60</td>
</tr>
<tr>
<td>Totals</td>
<td>59</td>
<td>42</td>
<td>16</td>
<td>117</td>
</tr>
</tbody>
</table>

Notes:
ASB – Asymptomatic Bacteriuria
UTI – Urinary Tract Infection, listed as probable as no clinical observations for infection was collected.

ii. Audit of UTI as documented in ACH resident aged care files

Usual operational procedures for the detection, testing and management of UTI were maintained in each facility throughout the study. An audit of participating residents’ aged care files for documented UTIs was undertaken for 12-weeks pre-study and for the 12-weeks during the study. UTI was operationally defined as any infection of the urinary tract where antimicrobials were prescribed and administered. There was an increase of documented UTI in both groups, presented at Table 5.12.

Table 5.12 : ACH documented cases of UTI treated with antimicrobials 12-weeks pre and 12-weeks during study for bidet intervention and usual care groups.

<table>
<thead>
<tr>
<th></th>
<th>Documented case of UTI 12-weeks pre-study</th>
<th>Documented case of UTI 12-weeks during study</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usual care control n=24</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Bidet intervention group n=25</td>
<td>5</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Totals</td>
<td>8</td>
<td>12</td>
<td>20</td>
</tr>
</tbody>
</table>
Despite an overall increase in ASB and probable UTI, staff in both states commented on individual residents with chronic, recurrent UTI that appeared to have ceased after the introduction of the bidet. For example:

Facilitator: “Can you tell me about the bidet and what it does from your perspective?”
Carer 1: “It helps reduce the risk of UTIs” (Group: Uh huh)
Carer 2: “There are some residents that it has definitely helped a lot”.
Facilitator: Can you tell me how?
Carer 2: well, M, it’s helped a lot - definitely - especially with UTIs, she used to get them constantly, since the bidet, she hasn't had a single one.
(Carers, AM and PM shifts, NSW)

It appeared that the focus on perianal and perineal cleanliness as well urine collection associated with the study had raised awareness of UTIs, prompting greater suspicion of UTI, testing and treatment:

Facilitator: “So overall, if we get you to comment on the benefits (of the bidet) for the residents, how would you summarise those?”
RN: “I found the benefits were picking up the UTIs, so they could be treated, and not passed and let go on, and let them get aggressive, go off their food, go off their drinking, you know, have other behaviours that are associated with the UTIs, and have that escalated. It was actually picked up and treated, in most cases treated straight away, and then they got the benefit straight away. Not, ‘Oh, they're not well this week, or today, they're not quite themselves’ you know, ‘Full ward test. Oh, look UTI’ In other cases it might of gone on for some time before, ‘Let's do a full ward test.' So it was beneficial in diagnosing the UTIs.
(RN Vic.)

Constipation

Constipation was operationally defined as bowels not open for 3 or more days. Number of documented episodes of constipation were extracted from the residents’ aged care file for 12-weks prior to the study and the 12 -weeks during the study.
For the usual care control group, 22 residents had pre- and post-study data. A related samples Wilcoxon signed-ranks test revealed no differences in constipation episodes pre-study (mdn=6.36) and during the study (mdn=6.70) (Z = .438, p = .662).

For the bidet intervention group 20 residents had pre- and post-study data. A related samples Wilcoxon test indicated a significant reduction in episodes of constipation when comparing 12 weeks pre-study (mdn=6.06) to 12 weeks during the study (mdn=3.25) (Z = -2.148, p = .032).

Results must be viewed with caution. In the usual care control condition 12 of the 22 residents had tied ranks, that is, showed no change. Likewise 15 of the 20 residents in the bidet group had tied ranks, leaving results based on very small numbers. A Mann-Whitney test comparing usual care and intervention groups for both 12-week periods showed no significant differences at 12-weeks pre (Z = -.067, p = .947); and for the 12-weeks of the study (Z = -.649, p = .517).

To explore whether the positive result for the bidet group was due to increased use of non-dietary aperients (i.e. laxatives) use was charted for the 12-weeks prior and for the 12-weeks of the study with data extracted from the residents aged care file. For the 12 weeks prior to the study, 10 residents in the bidet group took 1 or more prophylactic aperients. A further 5 were charted as receiving aperients on an ‘as needed’ basis at the discretion of staff. During the 12 weeks of the study, 11 residents in the bidet group took 1 or more prophylactic aperients, and 6 were given aperients on an as needed basis.

A consistently reported finding in all focus groups was that staff found the bidet effective in stimulating a void of bladder, bowel or both. As such, staff felt the bidet was helpful in the management of constipation. One enrolled nurse described her use of this effect:

Meredith Gresham
“So before bidet, you could sit someone with dementia on the toilet and it’s obviously hard to keep them on the toilet for a long period of time—not that you want them sitting there for a long time anyway, but it’s hard to keep them there. Whereas with a bidet, you put them on there, the warm water is obviously stimulating the anus and creating that peristalsis to open the bowels, so it’s good... if you sat them on a normal toilet, you wouldn’t have that effect.”

(EN Vic. AM shift)

As well as assisting the production of a bowel motion and managing constipation, staff commented how the bidet assisted in managing incontinence. In NSW, staff discussed in detail three residents whose faecal incontinence had been managed, in part, through the stimulation of the water stream of the bidet. For example:

“Remember how she used to get incontinent (of faeces) twice a day? Now it is once a day... It’s because, I find, in the morning when the water is running it helps stimulate, so therefore they are opening their bowels in the toilet, instead of us showering them and half an hour...(Oh yeah! Interjection from members of the group) later having them open them.”

(Carer, NSW)

**Staff rated cleaning ability of the bidet**

A total of 778 staff rated cleaning data forms were returned. Eighty-one (81) were incomplete and discarded from analyses. A total of 692 records of post voiding cleaning were examined. Results are presented in Table 5.13.

Cleaning success with bidet was defined as staff not needing to take any other cleaning action, other than the bidet, after voiding. For all toileting episodes where urine only was voided (either at toilet or incontinent), success with bidet was recorded around three-quarters of the time (range 69-77%). Success of cleaning with bidet after voiding bowels (with no faecal incontinence) was recorded in around a third of all episodes (range 36- 44%) and after faecal incontinence success with bidet was recorded a quarter (24%) to a nearly a third (32%) of the time.

Meredith Gresham
The ‘additional wipe’ category was intended to capture those episodes where the bidet had done an incomplete job of cleaning, and staff felt that additional action was required. This category may have been inflated. From focus groups and field notes, it was not clear that staff always responded consistent with the research protocol. Some staff commented they wiped to be able to rate the success of the bidet, while others indicated that they always wiped:

I don't usually use the dry button. I usually just automatically wipe, in case.... Because you never know... I’ll just give a quick other wipe over and it’s clean, that’s it”

( Carer, pm staff. NSW)
Table 5.13 : Staff rating of cleaning using bidet n= 692 records.

<table>
<thead>
<tr>
<th>At toilet visit</th>
<th>No incontinence prior to toilet visit</th>
<th>Incontinent prior to toilet visit</th>
<th>Incontinent of faeces</th>
<th>Incontinent of urine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Void faces</td>
<td>Void urine</td>
<td>No void</td>
<td>Incontinent of faeces</td>
</tr>
<tr>
<td>Number of records, n</td>
<td>61</td>
<td>103</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td>Percentage clean with bidet only %</td>
<td>36</td>
<td>77</td>
<td>82</td>
<td>24</td>
</tr>
<tr>
<td>Percentage additional wipe required %</td>
<td>57</td>
<td>13</td>
<td>9</td>
<td>48</td>
</tr>
<tr>
<td>Percentage half shower required %</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Percentage NA %</td>
<td>2</td>
<td>7</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Percentage missing %</td>
<td>3</td>
<td>4</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Total % (number of records)</td>
<td>100 (61)</td>
<td>100 (103)</td>
<td>100 (22)</td>
<td>100 (29)</td>
</tr>
</tbody>
</table>

Notes:
Analysis based on 692 records, with 81 incomplete records discarded from analysis.
‘Additional wipe’ was defined as the need to provide additional cleaning with toilet paper, face washer or wet wipes.
A half-shower is showering from the waist down.
NA indicates staff responded as bidet not appropriate for toileting episode e.g. male stand to void urine, or bidet would not be used immediately before morning shower.
Staff provided a ‘successful’ rating of the bidet where there had been no void at toilet or no incontinence for 22 toileting episodes. Staff reported in focus groups two reasons that may account for this rating; the first was staff taking residents to the toilet as part of a scheduled toileting program, where bidet was used despite no void occurring, secondly, as previously reported, staff indicated that they used the bidet as an alternative to showering, especially for residents who were distressed by this activity.

5.3.3 Staff results

Baseline Demographics

Overall, 73 staff consented to participate in the study, 39 from Victoria and 37 in NSW. Not all staff completed data collection. Staff movement, including resignations, new appointments, holidays, being rostered off on data collection days or being directed to work in different sections of the ACH meant that rates of completion of aspects data varied, sometimes considerably. In addition, some measures were only appropriate for staff who had practical experience of using the bidet with residents which precluded, for example, managers or recreational activities staff. In all results, the number of staff included in analyses are indicated.

Demographics of staff are presented at Table 5.14. Staff from the two participating ACHs were compared to determine if there were differences in age, level of education, time worked in their respective ACH, time worked in aged care in any capacity, current role, and if staff had tried the bidet for themselves.

An independent samples t-test confirmed that the NSW staff (n=28, M=30.82, SD=10.50) were significantly younger than the Victorian staff (n=27, M=46.81, SD 12.21) (t(53)=5.214, p = .000). A post-hoc Pearson $\chi^2$ analysis was conducted to determine any difference in level of education, in any field, between staff in the two ACHs ($\chi^2 = 5.90$, df=1,
In NSW more staff held tertiary (bachelors and post-graduate) qualifications, but in fields other than nursing or health-related disciplines.

Regarding time worked in the participating facility, there was no difference between staff of the two sites (t(57)= -1.15, p=.255). NSW staff (n=30) had an average length of employment of 43.37 months (SD= 44.8) and Victorian staff (n=29) had an average length of employment of 31.52 months (SD=33.34). However, in NSW (n=30, M=43.37, SD=44.81) staff had spent significantly less time working in aged care overall (t(57)= 22.56, p = .013) compared to Victorian staff (n=29, M=96.00, SD 102.77).

Sixty–two staff answered the question about their current role in the facility. The majority of staff (n= 48, 77.4%) involved in the study were personal care workers, assistants in nursing or care worker team leader, all without formal nursing qualifications. Staff with formal nursing qualifications varied: Victoria had 6 (9.7%) enrolled nurses and 2 (3.2%) registered nurses, and in NSW there were 4 (6.5%) registered nurses involved in the study.
### Table 5.14: Baseline staff demographics n=73

<table>
<thead>
<tr>
<th></th>
<th>Victoria</th>
<th>NSW</th>
<th>Totals</th>
<th>Test statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender N (% female) N=73</td>
<td>32 (82.05%)</td>
<td>24 (70.5%)</td>
<td>56 (76.7%)</td>
<td>$\chi^2 (1) = 1.336, p=.248$ NS</td>
</tr>
<tr>
<td>Age M (SD) N=55</td>
<td>46.81 (12.21)</td>
<td>30.82 (10.5)</td>
<td>38.67 (21-67)</td>
<td>t(53)=5.214, p=&lt;.001**</td>
</tr>
<tr>
<td>Highest level of education N, (%) N=58</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 10</td>
<td>2 (7.1)</td>
<td>1 (3.3)</td>
<td>3 (5.2)</td>
<td>$\chi^2 (1) = 5.90, p=.02^*$</td>
</tr>
<tr>
<td>Year 12</td>
<td>8 (20.5)</td>
<td>11(32)</td>
<td>19(32.8)</td>
<td></td>
</tr>
<tr>
<td>Cert 3</td>
<td>4 (10.3)</td>
<td>1 (2.9)</td>
<td>5 (8.65)</td>
<td></td>
</tr>
<tr>
<td>Cert 4</td>
<td>5 (12.8)</td>
<td>1 (2.9)</td>
<td>6 (10.3)</td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>6 (21.4)</td>
<td>3(10.0)</td>
<td>9 (15.5)</td>
<td></td>
</tr>
<tr>
<td>Bachelor</td>
<td>1 (3.6)</td>
<td>8(26.7)</td>
<td>9 (15.5)</td>
<td></td>
</tr>
<tr>
<td>PostGrad</td>
<td>2 (7.1)</td>
<td>5(16.7)</td>
<td>7 (12.1)</td>
<td></td>
</tr>
<tr>
<td>Time worked in aged care in months M, (SD) N=59</td>
<td></td>
<td></td>
<td></td>
<td>t(57)=22.56, p=.013*</td>
</tr>
<tr>
<td>Time worked at current ACH in months, M (SD)</td>
<td>31.52 (SD=33.34)</td>
<td>(SD=44.8)</td>
<td>37.54 (SD=39.71)</td>
<td>t(57)= -1.15, p=.255 NS</td>
</tr>
</tbody>
</table>

*Significant p=.05; **significant p=<.001; NS=not significant.

ACH – Aged Care Home

#### 5.3.4 Staff follow up results

**Frequency of use of the bidet with residents**

In week 12 of the study staff responded to survey questions concerning use of the bidet with residents and were asked to estimate the frequency of use on a 5-point scale from ‘daily’ to ‘not at all’. Forty-five staff responded to the use question and the majority (n=38, 84.4%) had used the bidet with residents. The main reason given for not using the bidet was being rostered to work with residents who were not part of the bidet intervention group. Forty-three staff estimated their frequency of use of bidet with residents. A little over half the respondents (n=24, 55.8%) indicated they had the opportunity to use the bidet with residents only a couple of times a month.

However, for residents with bidet equipped ensuite bathrooms, focus groups and field notes indicated that the bidet use became part of the daily routine:
“…And for people like (resident name) who refuse to shower, (we) like to sit her there on the loo each morning and just run it, maybe twice, that helps because she does not like to shower, she does not like you to help her wash…”

(Carer NSW, am shift)

“…So we’d always put them on the bidet every morning and give it a try…”

(Carer, Vic am shift)

**Expectations of bidet performance, workload and self-trial of bidet**

After the initial training, staff were asked to complete two 5-item Likert scales about their expectations of the bidet for residents and potential impact of the bidet on their workload. Both Likert scales were repeated at week 12.

In general, expectations of the bidet’s performance immediately after training compared with actual performance at 12 weeks were met. A related samples Wilcoxon signed-rank test for all staff indicated that there was no difference between week 12 perceptions of how the bidet performed for residents and baseline expectations, \(Z=115.5, p = .168\). Before the study 88.7% of staff felt the bidet would work for some residents (58.1%) or make a great and positive difference (30.6%); at week 12, the total had risen slightly to 93.4% of staff indicating that the bidet had worked for some (57.8%) or made a great and positive difference (35.6%).

For expectation of change in workload, a related samples Wilcoxon signed rank-test for all staff indicated that there was no difference between baseline expectations of toileting workload and week 12 perceptions of workload \(Z=115.5, p = .676\). Staff had positive expectations for a reduction in workload immediately after training with 85.3% of staff indicating they thought the bidet would reduce workload (41.2%) or make a great and positive difference to their workload (44.1%). At week 12, 86.4% of staff indicated that the bidet had decreased work load a bit (27.3%) or decreased a lot (59.1%).
At week 12, staff rated workload for usual, manual toileting care and bidet toileting care on the NASA Task Load Index (TLX) (lower scores indicate less workload). A related samples Wilcoxon signed-rank test for all staff indicated that the median score for the summed TLX on bidet toileting care was significantly lower than for usual toileting care (Z=148.50, \( p = .03 \)). TLX total workload and sub-scales are presented in Table 5.15.

Table 5.15 : NASA-TLX ratings of bidet assisted and manual, post voiding toileting care n=32.

<table>
<thead>
<tr>
<th>TLX Subscale domain</th>
<th>Median Score, Usual Care</th>
<th>Median Score, Bidet Care</th>
<th>Test statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental demand</td>
<td>8.0</td>
<td>3.0</td>
<td>Z=138.5, ( p &lt; .019^* )</td>
</tr>
<tr>
<td>Physical demand</td>
<td>10.0</td>
<td>4.0</td>
<td>Z=64.0, ( p &lt; .005^* )</td>
</tr>
<tr>
<td>Temporal demand</td>
<td>10.0</td>
<td>3.5</td>
<td>Z=62.0, ( p &lt; .021^* )</td>
</tr>
<tr>
<td>Task performance</td>
<td>4.0</td>
<td>4.0</td>
<td>Z=148.0, ( p &lt; .481 )</td>
</tr>
<tr>
<td>Effort</td>
<td>10.0</td>
<td>3.5</td>
<td>Z=74.0, ( p &lt; .003^* )</td>
</tr>
<tr>
<td>Frustration</td>
<td>7.0</td>
<td>3.5</td>
<td>Z=102.0, ( p &lt; .062 )</td>
</tr>
<tr>
<td>Total workload</td>
<td>50.0</td>
<td>36.0</td>
<td>Z=148.50, ( p &lt; .03^* )</td>
</tr>
</tbody>
</table>

*Level of significance \( p=.05 \)

Results indicate that median scores for toileting using bidet are statistically significantly lower than usual toileting care for the domains of mental, physical and temporal demand, as well as effort. The domain of task performance did not reach significance, indicating that staff were equally satisfied with their performance of cleaning in both conditions. Despite the median score for staff frustration associated with toileting halving, it did not reach significance.

Focus group data illustrated the complexity of the concept of workload and highlighted the number of variables that may affect perception of workload. For example, some staff saw the bidet as both time consuming and time saving, commenting that although the bidet seemed to take longer than a ‘usual’ toilet visit, it saved time by reducing work caused by incontinence later on:
“well quite a few times we would put somebody on the toilet, not going, waiting, waiting, waiting, …use the bidet and there they go. We would sometime do it (run the bidet) four times just to give that stimulation (to void)…. Changing a pad later on... that's incontinent. As far as I'm concerned, those few minutes, they were worth it.”

(EN Victoria, am shift)

While others perceived that the time required to operate the bidet was too time consuming for both staff and resident:

“It took a bit longer, some residents finished their toileting and then just wanted to stand up as we all do, but then we’re using a one-minute wash and a two minute dry, it’s roughly that; it was a waste of our time”.

(Carer, am shift Victoria)

For staff in Victoria in particular, the bidet prompted changes in toileting and continence practice. Some staff were keen to explore the capacity of the bidet technology, while others found the change in routine difficult. A few focus group participants expressed frustration when requested to use the bidet. Rather than simply changing an incontinence pad, the requirement to take residents to the toilet demanded use of lifting machines for non-ambulant residents. The use of the lifting machine was as a disincentive for some staff to use the bidet, even if the bidet was perceived to clean residents well:

“I found it (the bidet) cleaned them quite well... but the extra work of us putting people into the standing machine, pushing them into that bathroom; I found it put a lot of stress on us as workers, extra stress that we probably don't really need, extra pressure on your back.”

(Carer Vic. Am shift)

In Victoria, transferring residents with mobility limitations to the toilet became a major factor influencing whether the bidet was used or not. Following up reports from the Victorian study champion that some staff were not using the bidet revealed that there was a perceived increase in workload prompted by difficulty with pushing the lifting machine over the metal strip between the bedroom carpet and bathroom tiles. This carpet strip was a critical determinant of bidet use. Staff also expressed frustration at the inability to use the ACHs
existing mobile shower commode chairs as they were incompatible with the profile of the model of bidet used in the study at the Victorian ACH:

Carer 1: (The resident says) ‘Oh no, I want to go to the toilet’ but then we can’t get the (mobile shower-commode) chair over the toilet because the bidet’s there and to wheel her in the machine with pain, it just doesn’t work. The whole thing...

Carer 2: Especially getting over that little ridge....

Carers Vic. am and pm shifts

Other staff found bidet use reduced workload by decreasing staff involvement in toileting from 2-staff to 1-staff assisting residents living with dementia. It also enabled staff to effectively multi task to save time on other duties:

Carer 1: With a lot of our residents it used to be 2 assist for the bathroom, but now it’s just 1.

Facilitator: Oh – now tell me why is that so?

Carer 1: Well, one, they (resident) obviously wouldn’t want to sit down on a cold toilet seat, who likes to sit on that? So, one would be holding their hands and one would be assisting to clean, but now the toilet seat is warm, they’ll happily sit down and we can go about making the bed or whatever, while it is running.

Facilitator: So you can actually have the bidet running and go out and make a bed and do another job and the person will sit there, happily?

Carers, general response: Yeah, yeah , yep...

Carer 2: That’s what it’s like, we have a lot of workload been reduced, like we don’t... even like the time we spend in their room is much lesser than we used to before... it’s giving them (resident) time and going back and cleaning their room but now it’s like when you put the bidet on you will be changing their bed or you can even finish up cleaning their room or tidying up and by the time they are ready you go back in and dress them up .... Oh, and when the bidet is on you can always give them a wash, moisturise them, like whatever needs to be done we can do it.

(Carers, NSW am and pm shifts)
Self trial of the bidet by staff

In Victoria a bidet in a vacant resident bedroom was made available for use for four days at the outset of the trial. In NSW a bidet was installed in the staff toilet of the study unit. During week 12 staff were asked if they had tried the bidet for themselves. Nine of 22 staff in Victoria (40.9%) and 15 of 21 staff in NSW (71.4%) stated they had tried the bidet themselves.

Installation, maintenance, and technical performance of the bidet

Following the intervention, maintenance managers at each site were interviewed to garner their views on installation, maintenance issues and technical performance.

As found in the feasibility study, installation was reported as routine. Electrical work was carried out by licenced electricians, and installation of the bidet at both sites was conducted by the facility handyman. In NSW regulatory compliant wet area power points were installed in residents’ ensuite bathrooms, in Victoria the ACH opted to have electrics ‘hardwired’, that is permanently electrically connected, due to perceived risk of a power point in a ‘wet’ area. No issues were noted with either electrical system, however, after the death of a resident in the intervention group, staff in NSW had requested relocation of a bidet to a resident they felt would benefit. The relocation was successful and demonstrated portability of the technology which would not have been possible if the bidet had been hardwired. Installation of the remote controls also differed. In Victoria the ACH chose to install the remote-control within the vanity unit on the opposite wall of the ensuite to the toilet. In NSW, the remote-control holder was placed adjacent to the toilet. Proximity appeared to prompt bidet use, staff in Victoria commented that that they would forget to use the bidet due to the ‘hidden’ remote control.

No faults were reported concerning technical performance of the bidet. Again, as found in feasibility, the only maintenance issue reported was the need to replace batteries in one
remote-control in NSW. The researcher recommended drilling holes in the base of the remote-control holder in NSW as proximity to the basin meant splashing water collected in the holder.

**Adverse events associate with bidet use**

Over the course of the study a register of adverse events was kept. No adverse events directly associated with the bidet or bidet use were reported for residents or staff.

**Costs**

For this study costs of incontinence products were not able to be obtained at either site.

**5.3.5 Process evaluation results**

During focus groups, staff were asked about their views of the training, operational issues with the bidet and data collection techniques.

**Training and operation**

At the outset of the study, a 1-hour didactic classroom training session on bidet operation and study protocol was repeatedly run to capture as many staff as possible. A bidet was permanently installed on a staff toilet of the study unit in NSW. Staff in Victoria had the opportunity to trial a bidet in a vacant resident bathroom for 4 days before the study commenced. Staff considered training, both classroom and practical experience essential to confidently and effectively operate this novel technology. One staff expressed her lack of confidence though lack of practical experience:
“I went to the theory, but I didn't get a practical run through (i.e. either self-trial or demonstration of the bidet) so I had to rely on other staff members to show me, and even now, I haven’t tried one, just didn’t, I really think we could do with another theory, like a practical run through of all the controls because I really don’t know it all that well...

(Carer, am shift, Victoria)

Training was considered adequate, however some staff in Victoria felt ‘refresher training’ in the operation of the bidet should be more readily available.

With regards to effective operation of the bidet, NSW staff commented that the bidet installed in the staff toilet adjacent to the study unit provided practical, in vivo experience. NSW staff expressed that self-trial was necessary to understand the sensation of the water or drying air stream in order to coach residents through initial experiences, as well as become familiar with the variations in temperature, pressure and width to modify operations to suit individual residents.

Facilitator: Did it help having a bidet in the staff toilet?

Carer: "Yes, because otherwise we wouldn’t have experience with it (murmurs of general agreement) and couldn’t tell how it works properly."

In contrast, in Victoria, the majority of staff did not have an opportunity to trial a bidet themselves. Despite the prevailing view that bidet operation was “not rocket science either” (EN, Victoria) Victorian staff did not provide information during focus groups about how they nuanced operation for individuals. Only a few staff demonstrated confidence in how they initially introduced and supported residents with the bidet regardless of whether they had attended a training session or not.

One staff described her experience of using the bidet having not attended a training session:
"I didn't get training at all because the days it was on I wasn't here and so I just sort of had to go on (holds hands up to mimic holding a remote control) ... front... rear... and work it out. And I think there was a bit of paper or something giving you instructions in the bathroom that I stood there going, "Oh, yeah, this isn't overly hard," so just gave it a crack on the resident, and said, "Hang on miss, you'll feel water now," and hit the button. That's how I worked it out from there."

(Carer am shift Vic.)

Data collection

Data collection for staff involved completing toileting data sheets at weeks 1, 6 and 12 to record degree of cleanliness and other cleaning requirements; being interviewed by the researcher for baseline data concerning residents; collection of urine samples and answering survey questions (including Likert scales) in weeks 1 and 12.

Staff reported during focus groups that data collection was not considered onerous, however staff required significant numbers of reminders during data collection weeks to complete toileting data sheets for reporting cleaning. Forms were collected daily by the researcher or ACH champions. Staff considered survey questions straightforward.

Collection of urine specimens was a source of frustration for many staff, despite this task being a regular staff duty in ACHs. One RN reported “yeah, I’ve heard staff talk, even when we have to collect the urine, a few of them are ‘Oh, here we go again’ like it’s a bit of a...another job for them.” (RN Victoria). One EN volunteered that co-ordination of collection was problematic, referring to lack of follow through on usual procedures such as refrigeration of specimens, responding "Then there was again on our part, the lack of communication. How many (unrefrigerated) specimens did we find the next day that we had to throw out and start again?" (EN, Vic). The lack of coordination was seen by another RN as leading to frustration of staff with the process and then to the notion that “Oh it’s just too hard” (RN Vic.).
5.3.6 Additional focus group themes

Two additional themes arose during focus groups, ‘unfounded beliefs’ and ‘change and contradiction’. A third ‘theme of omission’ concerning resident dignity and privacy during toileting is noteworthy due to its comparative lack of comment during focus groups. This stands in contrast to emerging trends regarding dignity in care, in policy advice [35, 36] and clinical practice guidelines [37]. This section considers these three themes and concludes with a listing of methods staff used to introduce and support use of the bidet with residents.

**Theme 1: ‘Unfounded beliefs’**.

In Victorian focus groups, comments indicated the presence of various beliefs about the bidet, either unfounded or stemming from experience with one resident thence attributed to the broader ACH population. These included that the water stream of the bidet was cold, the bidet was unable to be used as a ‘normal’ toilet and the bidet presented a danger to residents.

Some care staff indicated the belief that the water was cold “they get that cold rush of water”; "That’s exactly right, and they get that cold rush of water" (Carers, Victoria). Others indicated that the bidet could not be used as a ‘normal’ toilet (ie. without bidet wash and dry functions) “If it was a normal toilet...” or there would be difficulties for new residents moving into a room with bidet equipped ensuite:

“What happens when the resident die and you have the bidet and the first one (resident) was a small person and the next one was bigger, what do you do, you changing the sizes or would it just stay whatever on this bathroom or what’s happening?"

(Carer, Victoria)

When further explanation was sought from focus group participants about this issue, one staff indicated that there was a general belief that “the hole in the middle of the toilet seat was too small” (Carer, Victoria). On further probing it appeared that this idea had its origin
with one, morbidly obese resident, whose gluteal size prevented him from urinating in the toilet when seated. Further investigation indicated that this was not possible with a usual toilet seat either and this man had been previously toileted using a bariatric commode. The situation however, appeared to generate the belief that the bidet was, in general, too small.

This notion that appeared linked to the belief of some staff that the shape of the bidet was dangerous or hurt residents. The bidet has a raised section at the rear of the seat that houses the electronic mechanism and is not designed to be sat on (see Figure 5.1). Still further discussion highlighted that some staff had difficulty in managing transfers using a sling or standing transfer machine effectively. One EN commented:

"... the staff needed to be trained (in transferring). Because at times I'd say, ‘Go forward’, like, ‘Go backward, they're sitting right on the back’, (ie raised section) and the staff wouldn't understand who you're talking to, they're not understanding what I'm referring to, you know, so they sort of need to go, "See that, they can't be sitting on that." You know, I just noticed a few people were positioned (that way)."

(EN Victoria)

Any apparent discomfort in seating the resident on the toilet tended to be attributed to the ‘smallness’ of the bidet and appeared to contribute to the idea that the bidet presented a danger to residents, rather than poor transferring techniques. This attribution appeared to be a critical factor in the decision of a carer not to escalate a situation for further investigation by senior clinical staff where a resident was in obvious pain. The staff member described the situation:

“I’ve had a very negative outcome with someone which I thought the bidet contributed to the lack of care that we could offer this person. She fractured her hip and we were pushing her on a standing machine, pushing, because there’s a lip from the bedroom into the bathroom and it takes two to push that machine, then to manoeuvre her. At the time it was unknown to us that she’d fractured her hip, where actually to get her to sit on the toilet, manoeuvring a leg that was turned inwards, we’re in dangerous positions ourselves, she’s screaming in pain. I did request to have it (bidet) removed because I thought it was dangerous but I was told no.”
Facilitator: “So it’s not the bidet per se, it’s the transferring that’s the problem?”

Carer: “Mmm”.

This resident had a fractured neck of femur from a fall unrelated to the bidet or to toileting, yet as the new equipment, the change in this resident’s behaviour had been attributed to the bidet as the source of the acute, new pain.

**Theme 2: Change and contradiction**

Some of the complexity around the adoption of new technology was illustrated by contradictory comments from some staff. In the example below, a carer justifies her decision not to use the bidet, but appears comfortable with the decision to deliver a similar experience for washing the resident’s perineum via more conventional equipment:

“I just didn’t fancy it (the bidet) at all. Can’t tell you why, just didn’t wouldn’t give it a go. I also think that with some of these residents, they’re elderly and they are used to going to the toilet, well I can’t say the old-fashioned way, but the normal way and they just sit on the toilet and have water squirt up onto them, well it shocked a lot of them. That’s invasive.”

*(Carer, Victoria)*

A short time later the same staff member commented:

“Our showers function like a bidet because we can change the rose to a jet, so if you are on a commode in the shower recess potentially, depending on the behaviours of the resident you can give them a squirt with the shower head.”

*(Carer, Victoria)*

Some staff discussed their concern about the potential risk of infection from spread of faecal matter in the toilet bowl via the water stream form the bidet. However, this appeared in contradiction to the use of the shower head as described above. For these staff, it appeared that they did not develop confidence in using the bidet and did not accept its use with residents.
Theme 3: Dignity, a theme of omission.

The effect of the bidet on the dignity of the toileting experience for older, dependent people is a key interest of this work, and a growing call from advocacy groups [38] as well as recent clinical practice guidelines [37]. However:

"And I think it's nicer for them too, I mean, having someone wiping your bottom and really getting stuck in there and, you know, it's not very dignified, is it? Let's face it. None of us look forward to that."

(Enrolled nurse, Victoria)

“I know that when I go to the toilet, I don't want someone in the toilet with me, fussing over me, trying to clean me, when I'm on the loo and they're only human too, so it's exactly the same for them. Now my own time... I want to be on my own when on the loo. I don't want two people at a time in there trying to clean me and wash me and shower me and everything like that. So to keep them who they were before they came in, still kind of alive by letting them do as much as they can, on their own...not surrounding them.”

(Carer, NSW)

A contrasting sentiment was communicated by some carers in Victoria for whom it appeared their role in cleaning up human waste was viewed as part of their role:

“We're experienced personal carers, we don't mind putting gloves on and assisting with bodily functions.”

5.3.7 Techniques used for introducing and supporting the resident using the bidet

Staff who used the bidet were unanimous that residents required support and encouragement, especially during initial experiences of the bidet. Techniques varied and appeared to be based on the staff member’ knowledge of conversational topics that distracted the resident and methods of engagement with which the staff felt comfortable. Staff indicated that techniques were usually used in combination.
Five key techniques were presented:

1. **Help the resident feel special** – a introducing the bidet as a “special treat” or “expensive luxury just for you”. This alerted the resident that there was something new and different.

2. **Positive encouragement** – introducing a sense of fun “it’s a magic toilet!” and humour to convey benefits “oh, we don’t have to use the dodgy toilet paper rolls!”

3. **Providing reassurance through verbal interaction** – staff counselled that they need to be prepared during initial uses for PWD to try to stand up from the toilet as the water stream starts, especially for people with dementia with little effective receptive communication: “she tried to jump up and I just tried to calm down her and said, it will just clean your bottom, there’s nothing to be afraid, you’ll be all right and it will cleaning your bottom and front... and there is no need to use the paper to clean. And she calmed down”.

4. **Providing reassurance through physical touch** – Physical touch and verbal reassurance were often used together. One staff illustrated using touch with a very difficult resident - "...we started giving a rub at the back first thing, I think we don’t need that anymore ... they are used to the feel (of the bidet)” or remaining close to the resident to provide reassuring touch.

5. **Redirection and distraction** – conversation about subjects that the resident found particularly engaging were used to distract the resident "... we’d usually try to redirect her by changing the subject... you know, ‘I’ve heard you met the queen?’  you know, just to try and get her off the thought of what’s happening, just so she’ll sit there quite happily while you talk to her and while you run the bidet...” and singing was used as a form of engagement and distraction "I thought ‘Singing in the Rain’ was pretty appropriate!"
5.4 Discussion

The purpose of this pilot study was to determine the clinical utility of the electronic toilet-top bidet for use by residents and staff in Australian Aged Care Homes (ACHs) and assess data gathering methods for outcomes associated with electronic bidets in this setting.

The major findings were that:

- Overall, the bidet was acceptable for both residents and staff.
- The bidet performed the cleaning job it is intended to do in the majority of cases (69-77%) of void of urine or incontinence of bladder, and between 24-44% cases after a bowel movement or incontinence of faeces, which may be a conservative estimate.
- Staff workload associated with clean up after toileting was statistically significantly reduced in the domains of mental, physical and time demands as well as effort as measured on the NASA-TLX compared to usual, manual personal care.
- Rates of constipation in the bidet group were significantly reduced compared to usual care control and 12-week pre-trial comparison.
- Qualitative results indicated that bidet use may have reduced number of episodes of incontinence, through more complete emptying of bowel and bladder at a toilet visit.
- In contrast to the one other extant study of bidet use with the population [39], no reduction in bacterial colonisation of urine was found, rather, the bidet group were significantly more likely to have a clear case of asymptomatic bacteriuria (ASB) or probable UTI.
Results are discussed below utilizing the four domains of clinical utility.

5.4.1 Clinical Utility

As previously described, the concept of clinical utility is multi-dimensional, comprising factors including the acceptability, appropriateness, accessibility and practicability of an intervention [2].

Acceptability

In this study, acceptability appeared to be the most fundamental domain of clinical utility. Results indicated that if the technology is not acceptable to those who use or experience it, the likelihood of its use diminishes, regardless of the performance of the technology on other domains of clinical utility. Qualitative data was crucial in revealing the complexity of the nature of acceptance or not, both at the outset of the study and over time.

Three related factors were described by staff that appeared to mediate initial willingness to use the bidet and whether the technology was embraced as a usual ‘tool-of-trade’ or not. These factors were trialability, that is the ability of staff to use the bidet for themselves over time, secondly, the knowledge of the capability of the mechanics of the bidet in order to confidently adapt use to suit conditions of individual residents (eg. obesity, haemorrhoids), the nature of the void or even climactic conditions and thirdly, compatibility of the bidet with other equipment and preferred, or habitual work practices.

Trialability and adaptability: The ‘in-vivo’ learning afforded through self-trial appeared fundamental to staffs’ understanding of the sensation of the bidet and subsequently, the effectiveness of the support they gave residents through the bidet experience. Staff who had ongoing access to the bidet appeared to develop a greater understanding of the controls and features of the bidet in order to adapt the experience for different residents under differing
conditions. Comparing NSW, where a bidet had been installed in the staff toilet of the study unit and Victoria, where self-trial of the bidet was limited to a few days prior to study commencement was marked. In NSW, staff had indicated that they used capacity of the bidet to vary temperature, pressure, width and angle of the water stream depending on what they felt would produce the best and most comfortable cleaning result for the resident, while staff in Victoria mentioned only using the ‘auto’ button, delivering a pre-programmed wash and dry. Observations by the researcher over the study period in both states, led to the impression that staffs’ personal experience of ongoing use of a bidet fostered a spirit of curiosity about the capacity of the technology to assist in cleaning, as well as confidence in the ability to support residents effectively. This was supported by the expression of unfounded beliefs, such as the bidet water stream being cold, which arose only in Victoria where there was limited opportunity for personal trialling of the bidet.

Compatibility: The third major factor was the compatibility of the bidet with mobility equipment and how the bidet affected usual patterns of work. As previously described, a change in usual work processes in Victoria resulted in reluctance of some staff to use the bidet. Following investigation, a compatible bidet and shower commode chair were located and trialled to confirm their compatibility. This resulted in three BA-13 Coway bidets and an ETAC shower commode chair successfully being deployed in the NSW site [40]. Issues of equipment compatibility, as well as the use of the bidet with obese residents that arose in the Victorian site were absent in NSW.

Rating of resident acceptance of the bidet significantly improved over the study. Residents were reported to quickly become used to the sensation, especially with appropriate support through individualising the experience, reassurance or distraction, with some residents eventually indicating they wanted the bidet turned on or appearing to enjoy the experience.
However, staff pointed out that the bidet was not universally acceptable. For some residents with dementia, any personal care task provoked distress, sometimes expressed as resistiveness to the activity or verbal or physical abuse directed towards the carer. As described in results, the bidet appeared to be intuitively used by some staff to not only minimise the distress of toileting, but overall personal care. Some staff used the washing capacity of the bidet to reduce the number of showers a resident required, and others reported using the stimulating action of the bidet multiple times to assist residents more thoroughly void bladder or bowel to avoid episodes of incontinence and associated care later in the day.

The frequency of verbal or physical behaviours during toileting, as rated by staff, decreased in the bidet group, over time and when compared against usual care controls. This potentially indicates that that cleaning with bidet was a less distressing experience than manual post voiding care. This is a notable finding given that for a majority of residents, the presence of dementia often rendered verbal explanation of the bidet ineffective.

**Appropriateness**

Appropriateness relates to the impact of the intervention on existing clinical care processes, the evidence base for its use and the efficacy and relevance of the assistive technology.

Toileting is the most frequent activity undertaken by Australian nursing home staff [41] and management of toileting, including bowel problems remain understudied for nursing home residents [42]. New technologies that may improve toileting are relevant for both staff and residents. In this study, the bidet had a generally positive impact on not only the process of toileting but also had a number of impacts more broadly.
Workload and effect on care practices

Staff workload directly related to toileting measured using the NASA-TLX showed a significant reduction in overall workload and four of the six domains of toileting workload, related to effort, mental, physical and time demands. The exceptions were task performance and frustration. Task performance is a measure of how well an individual perceives they completed a task, and for both bidet and usual care conditions staff considered they performed equally as well. The level of frustration associated with toileting showed a trend of reduction, but its failure to reach significance may have been related to issues brought up by staff during focus groups, such as the incompatibility of mobility equipment with the bidet, or the behaviour of the resident during toileting.

With respect to broader impacts on care practices, qualitative data revealed a spectrum of differences in staff perception of the bidet’s effect on care practices. At one end, the bidet was considered time saving, at the other, it was seen as time consuming. In Victoria some staff responses indicated they felt toileting with bidet took longer, a view that may have been formed either by perception of greater workload using a lifting machine and perhaps reinforced by the reported desire of some residents to leave the toilet immediately after completing voiding. Reports at the ‘time saving’ end of the spectrum related to a more expansive view of care practices, where staff spoke about the effect of the bidet to stimulate more complete voiding, thus reducing later episodes of incontinence and associated time spent in clean up, or the reduction in the number of showers a resident required.

Another care practice that produced diverging views related to the ability to leave residents alone during toileting. Some staff expressed the warm seat and warm wash of the bidet encouraged some residents to remain seated on the toilet. This gave staff time to attend to other tasks such as bed making or room tidying. Staff supported this practice noting it gave
the resident privacy. Other staff expressed an opposing view that they felt they needed to
remain with the resident for the whole toileting procedure when using the bidet. Individual
resident reaction to the bidet may have been factor in the decision to remain with the resident
or choosing to give the resident privacy.

Another major change reported in NSW was the reduction of the number of staff
required to assist with toileting, generally from 2 to 1 staff in attendance. Staff described usual
care as frequently requiring 1 staff to wipe the resident clean and another staff to hold the
resident’s hands, provide physical support to stand, or distract the resident from the procedure.
Staff time is the greatest operational cost for aged care service providers, with care staff costs
being two and a half times more than all other non-care staff costs combined [43]. Considering
the robust nature of the bidet (there were no reported maintenance issues either during the study
or the 18-months following) there is the possibility of a bidet recouping capital costs through
savings on staff labour.

**Urinary tract Infection**

Internationally, urinary tract infection (UTI) is reported as one of the two most common
infections in residential aged care settings [44-46]. Prompt diagnosis and appropriate treatment
is important to prevent further cognitive decline, functional impairment and even death in
nursing home populations. However, accurate diagnosis of UTI in this population is
problematic. Clinical features of UTI, such as pain on urination or fever can be difficult to
detect in elderly residents [47]. Nonspecific behavioural or functional changes (such as
increased confusion or falls) continue to be used by nursing home staff, as they were in this
study, as a key clinical indication of a UTI despite a number of studies finding no association
[48, 49].
Testing of urine in the nursing home using a multireagent ‘dipstick’ is a usual first step when UTI is suspected, yet this is also reported to be problematic [50]. Results of dipstick tests were observed in this study to be used as evidence to advocate to the general practitioner for commencement of antibiotics for residents, even prior to microbiological assessment results being returned, a situation consistent with other observational studies [50]. Multireagent strip urine testing has been deemed not suitable for screening nursing home populations for UTI due to high rates of false negative rates of certain microbiological indicators [44, 51, 52]. Furthermore, between 25-50% of nursing home residents may have a condition known as asymptomatic bacteriuria (ASB), that is the presence of bacteria in urine but without clinical symptoms or signs of UTI [53], for which the use of antibiotics is not recommended [51]. The use of antibiotics for questionable UTI or ASB has been associated with the rise in antimicrobial resistance [51, 54, 55] and has prompted increasing calls for better education for nursing home staff to implement care strategies for preventing UTI [52, 56]. Recent Canadian guidelines for the prevention and treatment of UTI in (non-catharised) nursing home populations [56] detail that improved perineal hygiene, such as preventing prolonged contact with urine or faeces for incontinent residents and ensuring complete emptying of the bladder through providing a ‘relaxed voiding environment’ are two of the three key strategies for prevention (the other was ensuring optimal hydration).

Results of the current study indicate that staff found the bidet helpful in maintaining perineal hygiene and prompting a more complete void of bladder or bowel, thus reducing episodes of incontinence. However, rather than a reduction in probable UTI as determined by microbiological testing, we found that residents in the bidet intervention group were significantly more likely to have a clear case of ASB or probable UTI compared to controls. A number of reasons may account for this finding, including that as a non-random sample, the bidet group was significant more likely to be faecally incontinent and in NSW, were more
functionally and cognitively impaired, which may have predisposed the intervention group to UTI though faecal contamination. Twenty-five percent of the usual care control group did not wear incontinence pads compared to 8% of the bidet intervention group. Consistency of bidet use for individual residents was not measured. The sample was small, and the study was not sufficiently powered. The rates of UTI detected and referred for review by the residents GP as part of the ACHs usual practice also saw a rise in UTIs treated with antibiotics in the bidet intervention group from 4 in the 12-weeks preceding the study to 8 during the study. The study had an evident ‘Hawthorne’ participation effect’ [57] where the level of staff vigilance of UTI was observed to rise which may also explain some of the increase. These results are in contrast to the only other study of bidet use with this population where urine bacterial colony counts were reported to have significantly fallen in residents toileted with bidet, when compared to a usual care comparison group [39]. One other study has reported potential for development of UTI associated with bidet use in adult women [58] however this work was challenged on methodological grounds [59]. Clearly, these divergent results require further investigation to understand under- or over-detection of UTI in ACH residents and the potential effects of the bidet.

**Behaviours of concern during toileting**

Overall, behaviours of concern during toileting decreased. Staff are most likely to be abused verbally or physically during personal care with the primary antecedent reported to be the personally ‘invasive’ nature of the task [60-63]. The ability of the bidet to provide a ‘hands off’ approach for staff and give some privacy and potentially dignity to the resident may have reduced the sense of invasion of personal space.
**Constipation rates**

Constipation for the bidet group decreased significantly comparing the 12-weeks pre- and post-study and there appeared to be no substantial increase in use of non-dietary laxatives. While the significance of the result was lost when compared with the usual care group, staff comments concerning the ability of the bidet to assist in more complete emptying of bowels were persistent. The mechanisms for improved voiding are unclear, but may be related to findings of two studies that demonstrated that the warm water stream from the bidet induced anal sphincter muscle relaxation in healthy adults [64] and another that demonstrated the bidet reduced the time taken to produce a bowel movement in people with spinal cord injury, positing that the water stream stimulated peristalsis (smooth muscle contraction of the bowel) [65]. It is probable that these effects also occurred in the current study sample.

### 5.4.2 Practicability

Within clinical utility, practicability of an intervention involves the ease of use, suitability for task and the knowledge required to enable use.

While staff reported that the bidet ‘*was not rocket science*’ to operate, a more sophisticated understanding of the bidet appeared to assist staff in adapting the bidet to suit individual residents and greater confidence in supporting residents. In terms of suitability for task, the bidet was adequate in cleaning, although with greater familiarity with the capacity of the bidet and understanding of individuals’ bowel habits some staff began to utilise the stimulating capacity of the bidet to prevent incontinence. Knowledge required for bidet operation and staff training has been previously discussed.
5.4.3 Accessibility

Accessibility refers to procurement, cost, resourcing implications and reliability of an intervention or technology.

The retail cost of this electronic bidet has remained stable over this work and the supplier was available throughout the study period (and afterwards) to address any concerns or supply spare parts, if required. During the study period and follow up one year – 18 months later, the bidets are reported to be robust, reliable and remain in daily use. Maintenance was minimal and related to replacing batteries. Variations in cost of installation were related to difficulty of access to existing wiring in the buildings.

Unfortunately, neither ACH was able to provide reliable cost or use data of incontinence products. In Victoria, the ACH underwent a review of incontinence products supply and instituted a new ordering system during the same time the study was conducted. In NSW, accounting for the supply of incontinence pads was for the entire 146-place ACH and ordering was on a centralised ‘as needs’, rather than a regular monthly basis. For both ACHs, comparison of incontinence product cost of the study period with other time periods would have been unreliable was therefore abandoned. Cost of incontinence products represent a significant portion of non-care staff costs, with one 2010 analysis indicating it comprised 5% of this budget [43]. Findings in feasibility reported in Chapter 4 support a potential for cost saving in incontinence products. Future studies could explore cost-benefit to understand if bidets present opportunities for cost recovery and future savings in this area.

Maintenance manager and capital works staff indicated that there were no regulatory issues from an aged care, Building Code of Australia or local council perspective that would prevent installation of bidets. Interpretation of risk was a point of difference for each ACH.
Victoria chose to ‘hard wire’ rather than use wet area power points to eliminate risk of water contact with power sources. Hard wiring however, prevents the easy redeployment of a bidet in another bathroom should this be considered necessary in the future.

5.4.4 Process evaluation - outcome measures

A key aim of this study was to assess suitability of measurement tools and methods of data gathering for aged care homes.

A number of data sources and techniques for data gathering were used. Sources included the residents’ aged care files and interviews with staff. Techniques were chosen for efficiency of time in administration and potential to yield the most accurate information. For example, an interview with staff was used to administer the NASA – Task Load Index in order that staff received exactly the same interpretation of each domain and had the opportunity to ask questions if they required clarification. Potential bias that may be introduced by having the researcher present during completion of these surveys was minimised through the interviewer being unable to see what ratings were being given and the use of multiple data sources (survey questions, focus groups) to establish internal consistency of results.

Overall, interview and survey data gathering methods appeared to have good ecological validity. The use of both quantitative and qualitative methods to capture data on the same topic provided an opportunity to triangulate data. This assisted to validate results and also provide an understanding of differing viewpoints of the topic.

Prior to study commencement, negotiations with participating ACHs were undertaken to provide administration of the Incontinence Associated Dermatitis (IAD) tool [16] and collection of urine specimens by staff. The IAD instrument [16] was not completed in NSW, despite ongoing assessment and maintenance of perineal skin integrity being a key clinical
activity in ACHs with incontinent residents [66]. Carers in NSW felt uncomfortable with the requirement to carefully visually inspect this area and continued to follow usual practice of a ‘discreet peek’ (Carer NSW) during showering, changing incontinence pads or dressing. The collection of urine is also a routine clinical task in ACHs, however this was also problematic. As previously reported, some staff felt additional specimen collection was onerous, ACH processes were fallible (such as the example of non-refrigeration of specimens overnight), and very limited cognitive and communicative capacity of some residents meant obtaining a specimen was almost impossible, resulting in having to wring out wet incontinence pads to obtain some specimens. Accuracy of microbiological analysis requires at least a mid-stream urine specimen. In many cases this was not possible to obtain.

A new scale was developed to measure staff’s perception of change to incontinence associated odour was reported to be simple to administer and easy for respondents to understand. While the measure failed to reach significance, comments about reduction of odour persisted in focus groups. Environmental odour is frequently listed on checklists for choosing a nursing home provided by advocacy groups [67, 68] as an informal indicator of a quality nursing home.

5.4.5 Strengths and Limitations

This study has a number of limitations, but also a number of strengths. A primary limitation is the small sample size, limited as already indicated, by funds available to purchase and install bidets. Lack of randomisation through staff choice of resident was a key limitation, however, it was a pragmatic decision based on the experience of feasibility where staff appeared to need a sense of ‘control’ or ‘ownership’ of the study process to elicit their cooperation with bidet use and data gathering. Quantitative results in particular must be interpreted with caution, due to a lack of statistical power. To investigate an appropriate sample
size for future studies, a post-hoc power analysis using the G*Power software package [69] with alpha at .05 and power (1–β) at 0.8 was conducted. Due to the lack of existing research in this area to establish an effect size, an estimate of 0.5, a medium effect was used [70]. A two-tailed power analysis revealed that each condition would require 64 people to detect this effect size as significant at the 5% level using an independent samples t-test.

As an investigation of a new assistive technology intended for residents and staff in nursing homes, a pragmatic study design was a strength, testing the bidet in real-world, busy nursing homes that are subject to often rapid turnover off staff [71] and have a variety of residents with idiosyncratic and complex conditions. The use of staff as data collectors and informants is a strength with regards to the face validity of results, but also presents difficulties regarding the quality of the staff recorded data, including possibility of bias, and frequent staff changes that resulted in some incomplete records, or misinterpretations of the requested data. From a research perspective, ACH files were found to have missing data, contradictions and some records were of questionable reliability.

The relationship with commercial supplier needed to be carefully managed to avoid bias. In this study, all commercial arrangements were managed by participating ACHs purchasing departments and gratis assistance from the retailer involved (i.e. toilet seat ‘painting’ and initial training in operation) was accepted by the ACHs based on the understanding that there were no actual or implied conditions attached.

A strength lies in the use of mixed methods. Neither quantitative nor qualitative data alone would have been able to give a full picture of the complexity of implementing a novel technology. Mixed methods permitted depth of understanding of the data through qualitative techniques, while quantitative methods gave clarity where opinions appeared divided. The complementarity of both techniques within a Critical Realistic framework provided the
explanatory focus of ‘how’ and ‘why’ that is essential to understand when implementing novel technology and the accompanying change in clinical practice.

5.4.6 Conclusions

This mixed methods, clinical utility pilot study of the electronic toilet top bidet in Australian aged care homes found that the bidet was acceptable for the majority of residents and staff. Trialability by staff appears to be an important element in more rapid acceptance and better understanding by staff of the capacity of the bidet to perform the task of cleaning after voiding. This was confirmed in the site where ongoing trialability was not offered and resulted in lower confidence of staff in the use and operation of the bidet and its features. The bidet was generally reported to be easy to operate, installation was routine and maintenance minimal. The bidet was reported to clean adequately between 69-77% of the time for all voids of urine and between 36-44% of the time for void of faeces, including incontinence. Positive outcomes were found for reducing staff workload associated with toileting, and potential improvements were found for resident behaviour during toileting and reported rates of constipation. No changes were found with respect to incontinence associated dermatitis, however baseline rates were reported to be negligible. No changes were found in odour associated with incontinence using a scale developed to measure strength of odour and frequency, despite anecdotal reports of improvement. Of concern was the result that residents in the bidet condition were found more likely to have a clear case of asymptomatic bacteriuria or a probable urinary tract infection that those in the usual care control condition, though higher rates of faecal incontinence, poorer function and cognition in baseline measures of the intervention group may have had a mediating effect on this result. Outcomes measures were appropriate and had good face validity. As a pragmatic study, this work has good ecological validity and preliminary results warrant further investigation.
5.5 References


Chapter 6  Discussion

6.1  Introduction and key results of this work

This body of work has examined the effects of using the electronic toilet top bidet for cleaning after voiding bladder or bowels for older people dependent in toileting activities, family carers and aged care home (ACH) staff. The importance of this work is underscored by the aging of the Australian population. Advancing age is associated with greater burden of disease and greater likelihood of activity limitations, including toileting [1-3]. Inability to adequately manage the mechanics of toileting is a frequent precursor to entry into aged care systems is often emotionally and physically demanding for those that provide care [4, 5] and is reported to be undignified and distressing and for those who require assistance [6, 7].

A scoping review of the literature concerning the bidet, captured extant knowledge of the bidet and its use in health- or care-related contexts. A major feature of the literature included the lack of research papers; of the 39 publications located for the review, only six comprised a report of experimental research that used either a control or comparison group [8-13]. Only two were interventional studies [9, 11] and of these two, only one [9] examined the use of the bidet in an aged care context. Another feature was the theme of harm versus benefit of bidet use, which was difficult to reconcile as the literature was characterised by low quality studies, and 30 of the 39 publications did not state the type of bidet that was the subject of the article. A third of the publications characterised the bidet as an effective assistive technology (AT) for post voiding cleaning and promoted advantages of its use for people of all ages with functional limitations and for reducing demands of care for family or professional carers.

Exploratory interviews of five family carers’ experiences of using the bidet found it was successful for three of the five carers in both cleaning and reducing physical and emotional stress associated with this task. Unsurprisingly, their experiences also underlined the necessity
of cleaning after toileting and emphasised how the bidet addressed practical issues for carers associated with post-voiding cleaning, such as back pain experienced while physically supporting a dependent adult to stand to clean. Interviews also highlighted that the manner in which cleaning is carried out has broader symbolic meaning for the family carer. For some carers, having a technology to automate cleaning represented the ability to keep an older dependent family member living at home for longer, or the ability to ‘normalise’ the mother-daughter, husband-wife relationship between carer and dependent person through de-emphasising the infantilising nature of the task. An alternate view was that manual cleaning represented delivery of optimal care for the dependent older person.

On the strength of the findings from literature and carer interviews, a single arm, mixed-methods, feasibility study was undertaken. This study determined that the bidet was feasible in an ACH with regards to procurement, installation and reliability, it was acceptable for residents and staff, and performed the cleaning task intended for over half (53%) of episodes of faecal incontinence and 70% of cases of after a bowel movement. Results of the qualitative component of the investigation supported the observation of initial reluctance of some staff to adopt new technology and highlighted that staff acceptance of the bidet may be a significant issue in any subsequent work. Staff reported other observations from their use of the bidet with ACH residents. These included perceived reduction in rates of urinary tract infection, improvement in incontinence associated odour, the capacity of the bidet to stimulate a more complete void of bladder or bowel which reduced overall episodes of incontinence and, consequently, a reduction in the number of incontinence pads required saving the ACH an average of $A2009 for incontinence products over 12-weeks of the study.

This work led to refining and developing further measures to be used in a non-randomised, mixed methods, pilot study which was conducted in two Australian ACHs. This
study assisted in building an understanding of the clinical utility of the bidet. Results provided additional support for the acceptability of the bidet for ACH residents and staff, but stressed that acceptance by residents with dementia appeared to be based on staff’s ability to provide effective support, especially during initial experiences of bidet use. Staffs’ acceptance appeared to be mediated by trialability, the compatibility of the bidet with existing care and work practices, and perceived impact of the bidet on the resident.

Other key results were the significant reduction in staff toileting workload using a bidet when compared to usual manual cleaning. The bidet was reported to clean effectively (indicating that the staff needed to take no other cleaning action) between a quarter to a third (24-32%) of the time after an episode of faecal incontinence, 36% of the time after a bowel movement and 77% of the time after voiding bladder. While lower rates of clean up success were reported than in the feasibility study and in one study in the US [9], this may have been a conservative estimate due to staff reporting that residents required an additional wipe to complete cleaning, when they were doing the check measure of cleanliness. Consistent with these previous two studies, there were reports of the bidet stimulating a more complete void of bladder and bowels, which was reported by some staff to reduce the frequency of episodes of incontinence as well as reducing episodes of constipation in the intervention group.

Contrary to staff perceptions that the bidet appeared to reduce rates of infection in some residents with chronic UTIs, and in contrast to the only other study of the bidet with nursing home residents [9], the likelihood of having a clear case of asymptomatic bacteriuria or a urinary tract infection (UTI) increased in the bidet group. This finding possibly reflects the complexity of testing for bacterial colony counts in older ACH residents and highlights the need for more stringent procedures for collection and testing of urine samples in future studies. A minority of staff expressed that the bidet had potential for improving dignity of residents.
during toileting, largely through providing greater privacy and less intrusiveness when using the toilet.

The following discusses the clinical utility of the bidet and implications of the findings for the broader development of theory concerning the uptake and ongoing use of AT, aspects of clinical practice and care practices for the older person, staff and family carers. The chapter concludes with a discussion of the limitations and strengths of this body of work.

6.2 Clinical utility

This work was guided by a framework of clinical utility characterised by staff or family carers’ views of four key components of utility, being the acceptability, appropriateness, accessibility and practicality of the bidet. [14]. The primary focus of the framework is on the dynamics of adoption or rejection of innovations and their embedding in routine clinical or care practice.

Acceptability

Overall, findings indicate utility of the electronic bidet in aged and dementia care in both community and residential settings. There was a high degree of acceptance by the older person, regardless of whether they had dementia, however as indicated previously, acceptance appeared to be predicated on the carer’s ability to provide effective support. Acceptance by staff appeared to be consistent with the differential rates of adoption of new technologies as proposed by Roger’s theory of Diffusions of Innovations [15], where small numbers of staff immediately embrace the change, followed by larger groups labelled in the theory, as ‘early-’ or ‘late-majority’ adopters. A key source of influence concerning staff’s views of acceptability of the bidet was informal staff discussion. As demonstrated in Chapter 5, in the ACH without a bidet available for staff use, staff discussion was a major conduit of incorrect information.
about the bidet, such as the water being cold. Without the ability to trial the bidet assumptions could not be challenged or corrected and dominant opinion, whether correct or not, appeared to influence the acceptability, and subsequently the use of the bidet with residents.

Despite some staff expressing reservations about the bidet during the study, informal follow up with study champions 12-months following study completion indicated that bidet use has become routine daily practice in all three ACHs. Additionally, champions at each site reported that staff have requested that management provide additional bidets for resident care.

**Accessibility and practicality**

Bidets were found to be practical for staff to operate and use, but staff required appropriate training, particularly when a bidet was not available for staff to trial and familiarise themselves with the operation and sensation of using a bidet.

In all three studies, installation of bidets was routine, they met local and state water and electrical regulatory requirements. They appear to be robust, no maintenance was required during the course of the study other than the replacement of batteries in remote control units. Economic value remains to be to be investigated. Feasibility indicated potential cost savings in incontinence product expenditure after installation of bidets, however costs were not able to be determined in the controlled pilot ACH sites.

**Appropriateness**

The impact of the bidet on existing practices of manual toileting care was, in general, positive, improving the experience of toileting for both residents and staff. Negative impact on work practice was reported at one study site, where transferring non-ambulant residents to the toilet using a lifting machine, rather than the usual shower-commode chair was required to use
this workload issue was satisfactorily addressed after introduction of a different model of bidet and compatible shower-commode chair [16].

Clinical efficacy, that is rigorous assessment of health outcomes, both benefit and harm associated with a new practice or innovation, is also a sub-component of appropriateness within the framework of clinical utility [14, 17]. Efficacy studies have traditionally underpinned adoption of new clinical processes [18]. Despite this, efficacy has appeared to play a limited role of clinicians’ or carers’ decision-making processes of whether to adopt the bidet or not. A key issue confronting use of rapidly developing technologies, such as the bidet, is the limited understanding of health outcomes from novel technologies, that may later prove to have drawbacks for the user. Findings in this study of an increase in asymptomatic bacteriuria and probable urinary tract infection in the controlled study provides a case-in-point of the evaluation paradox [19] (described in Chapter 2) where rapid development of technologies outstrip the time required to complete rigorous research on a spectrum of clinical and health outcomes.

The studies presented in this body of work have provided some support for the use of this framework of clinical utility as a tool for the assessment of feasibility of novel care technologies from a range of stakeholder perspectives. Additionally, this work has emphasised the interdependence of each of the components of clinical utility providing a more nuanced understanding of reasons why a technology may fail to be used. As described in Chapter 3, for example, one family carer rejected the technology due to her perception of its acceptability, that is, the bidet did not meet her goal of optimal care for her mother, despite its accessibility (being installed at no cost in her own home), practicality (being fully functioning and simple to operate) and appropriateness (delivering automation of a necessary physical task).
6.3 Theoretical implications

Current theoretical frameworks concerning the adoption and ongoing use of assistive technologies are relatively underdeveloped [20]. Relevant theories that have more broad application tend to describe or predict the dynamics of a dichotomous relationship of the AT with a primary user [21-23].

Despite domains that provide for assessment of usability in clinical settings, the framework of clinical utility [14] also does not explain or predict adoption or usage of an AT. AT is seen as a promising adjunct in meeting care needs of ageing populations world-wide [24, 25]. Nonetheless, in practice there are reports of low uptake and implementation of assistive technologies as well as high rates of abandonment [26]. In order that there be better use of AT resources, effort has been made to develop theoretical models that seek to describe factors and their interactions that predict their adoption, use or abandonment. A 2016 review found at least 14 conceptual models have been developed for recommendation and implementation of AT [27]. No model has yet demonstrated clear predictive power to explain uptake and use, or non-use of AT for a diversity of people with functional limitations, contexts and technologies [27, 28]. Some models provide thorough description of phenomena, but lack the parsimony required for a useful theoretical approach [21] while others focus on simplicity at the expense of taxonomic detail [29]. Some models include assumptions that a health professional (or AT provider) is always involved in the prescription or selection of AT [21] and others focus on outcomes for the informal carer in the process of deployment of AT [30].

Even considering generalisable models that account for complex relationships between individuals in varying environments in the performance of activities [23], there is inadequate ability reconcile competing outcomes, which limits their predictive capacity. For example, the person-environment-occupation model asserts that theses domains “interact continually across
time and space in ways that increase or diminish their congruence... the outcome of greater compatibility is represented as more optimal occupational performance” (p.17). However, the model does not indicate whose occupational performance outcome – the dependent person’s self-care or staff’s or carers work role– has primacy, nor how reconciliation takes place when the performance of the task appears to be incongruent.

Models have not articulated implications of who is the primary decision-maker concerning the adoption and use of an assistive technology, particularly when a dependent person has limited decision-making capacity, nor do models tend to consider the variation in impact of technology use on the different individuals involved in the continued use of the technology. Variations in the factors considered in models limit broader theoretical applicability.

There is one model which presents a framework for uptake and outcomes of AT that can be used to explain both the reactions of family carers, and staff in the use of the AT. This model, developed by Lenker and Paquet (2004) seeks to predict assistive technology use and focuses on a user centric approach, conceptualising decisions about the uptake and continued use of AT as a dynamic process, ongoing over time [28].

Their nascent conceptual model seeks to explain adoption and continued use, or discontinuation, of ATs in different contexts and settings appears to have the flexibility of descriptive and predictive elements that could incorporate this more complex 3-way relationship of AT, carer and dependent person in a variety of contexts [28].

Lenker and Paquet’s model [28] brings together theoretical propositions of human behaviour, attributes of ATs and their interaction. Already described in Chapter 3, its background is summarised here. The model draws upon various theories of social cognition that state behaviour, (in this case use of an assistive technology) can be predicted by an
individual’s perception of the degree of benefit that will be derived from that behaviour [31, 32]. Benefit is conceptualised as an outcome of an ongoing process of comparison of one intervention against another, and subject to change over time and context, as described in the Parallel Interventions Model [33, 34]. Thirdly, the model draws upon Perceived Attributes Theory, part of the Diffusions of Innovations model [15], which describes seven attributes of a product (or an AT) which mediate an individual’s decision to use it. The seven attributes are perception of relative advantage (i.e. benefit), compatibility with existing contexts, (which may be, for example, environmental constraints or personal values), complexity, trialability and observability, the product’s capacity for ‘reinvention’ such as adaption to a person’s changing needs over time and contact with others acting as facilitators in the use of the product, such as prescription of compatible equipment to address mobility needs with the bidet.

The theoretical model is presented at Fig 6.1. The model commences with opportunity to use assistive technology (AT). An individual develops a perception of the relative advantage of the AT for themselves or for task performance, and subsequently an intention to use it or not. Actual use is mediated by context, including attributes of the person, the task and environmental considerations. If used, impact of the AT is assessed by users to derive a perception of benefit. Benefit is weighed against real or perceived benefit of parallel, or other interventions that may achieve or are designed to achieve the same outcomes. If greater benefit is perceived from the AT under consideration, use will continue. The model is presented as a continuous loop, indicating the perception of advantage, use, impact and benefit is an ongoing process, mediated by changes in context.
Findings from this body work contribute to the elaboration of this model, illustrated at Fig. 6.2. The existing model suggests that initially, perceived relative advantage accrues from opportunity to use the AT. After examining findings from this work, opportunity remained a fundamental aspect of the model, but the development of perception of relative advantage appeared to be formed through exposure of the potential user to a range of elements.

For example, during feasibility staff had opportunity to use a bidet. Some staff quickly formed the perception that the bidet would not work for practical care applications. Opportunity led to other staff to trial it, perceiving advantage and subsequently becoming change agents; informing others, influencing the perception of relative advantage. For other staff, the educational session appeared to prompt re-examination of attitudes toward personal care with residents and comparison of bidet assisted toileting against current manual care practices (as described in the model though comparison of perceive benefit of parallel interventions) to form their opinion of relative advantage. For some family carers, the bidet symbolised a potential mechanism for keeping a loved one at home. The symbolic potential of
the bidet was key in these cases for the family carer to form a perception of relative advantage. Opportunity thus underpinned a process of assessment of relative advantage unique to each individual, which appears to be fluid process influenced by trialability, information or education, peer influence and attitudes toward or symbolic aspects of the task.

In Lenker and Paquet’s model original model, formulation of a perception of relative advantage led to an intention to use the AT, modified by context. Context is described as being a mediator at a point in time, after forming an intention to use and before actual usage occurs. Current findings support this contention. For example, family carers and staff were unable to use the bidet, despite an intention to use, due to the context of environmental constraints, such

Figure 6.2: Elaborated conceptual model of predicting usage of assistive technology
as inability to get a lifting machine into a domestic toilet room or incompatibility with other mobility equipment.

However, experience from current studies indicated that context is more pervasive. Context did not simply exert a dichotomous ‘use or not use’ influence, rather it influenced the way in which the AT was used, the direction and strength of impacts and the formation of perception of benefit. For example, the background context of organisational policy and procedure of transferring residents to the toilet using a lifting machine, affected staff’s willingness to use the bidet, but they were in a situation of being required to use it by management. This context appeared to exert a pervasive and complex influence over the impact of the bidet on staff and the degree of benefit they perceived.

In the Lenker and Paquet model, impact is conceptualised as the usability of the AT and its impact on the user’s quality of life. In the present work impact was evident at three levels – for the resident, for the staff or family carer, and for the work processes around the task of toileting. Again, context appeared to play a mediation role in the degree of impact. For example, as described in Chapter 5, some staff chose to use the bidet with residents who had negative experiences with it. These staff viewed the negative reactions in a broader context of overall personal care, choosing to continue with the bidet in order to reduce other, perhaps greater negative reactions brought about by showering. For other staff, the impact of the bidet on work process, such as using the lifting machine, was experienced as a negative impact. Regardless of whether staff considered the bidet advantageous for toileting or not, as described above, the context of work practice had a direct influence on impact, the perception of relative benefit, and consequently, influenced continued use. A third example was with a family carer who used the bidet only once with her mother. The impact of the water stream caused her to ‘jump up’. The impact on the care recipient was enough to influence the carer to never use the
bidet again. The context underlying this event was that the carer could not recall any education about operation of the bidet, nor information about how best to support a person with dementia through initial bidet experiences.

A change of context may influence outcomes at any stage of the model; usage, impact and perception of benefit. If the daughter whose mother reacted poorly to a first trial had education and information about settings of water pressure for the bidet and information on how to support her mother, the impact and perception of benefit may have been different.

Current findings support the descriptive components of the conceptual model. The proposed elaboration may add to the explanatory and predictive power of the model.

6.4 Clinical implications

This body of work has highlighted implications of bidet use in three additional, key clinical areas of interest; urinary tract infection (UTI), constipation and incontinence.

6.4.1 Urinary tract infection

For over a decade, ACHs have been regarded as a reservoirs of multi-resistant strains of bacteria [35, 36], due in part to the overuse of antibiotics for cases of UTI that do not meet minimum diagnostic criteria [37] or in cases of asymptomatic bacteriuria (ASB) where antimicrobial therapy is not indicated [38]. Antimicrobial resistance has been characterised by the US Centre for Disease Control as a global threat to human health due to emerging strains of multi-drug resistant bacteria that cannot be controlled with known antimicrobial treatment.

As discussed in Chapter 5, the bidet would appear to provide a mechanical prevention strategy for UTI though potential improvements in perineal hygiene and more complete voiding of bladder and bowel for older, incontinent ACH residents [39]. However, findings of
the present work were that residents toileted using bidet were more likely to have ASB or a probable UTI than those receiving usual care, in contrast to the only other study of the bidet with nursing homes residents that found a reduction in urine bacterial colony counts after 8-weeks of bidet use [9]. In the current work, procedural limitations such as difficulty with collection of urine samples and an underpowered study may account, at least in part, for the results.

Further, appropriately powered and controlled studies of the effects of the bidet on UTI are required to explore the possibility of the bidet as adjunct to better global antimicrobial stewardship.

### 6.4.2 Potential improvements in management of incontinence, constipation

In each of the study ACHs, bowel management was largely the purview of assistants in nursing, with varying levels of oversight by registered nursing staff. For all three ACHs the mainstay of incontinence management was the use of incontinence pads and to a lesser degree, scheduled visits to the toilet, which may have little to do with individual residents’ biological need to void, evidenced by the number of toilet visits where ‘no void’ was obtained.

In each ACH some staff intuitively recognised and capitalised on the ability of the bidet to stimulate more complete voiding of bladder or bowel, in order to reduce the chance of incontinence at a later time.

Staff attributed the more relaxed toileting environment when using the bidet, such as the warm seat that encouraged the resident to sit down and the need to give the resident extra time on the toilet to go through the washing process, as well as the action of the warm water stream to relax the anal sphincter muscle as contributing factors to the modest reduction of constipation observed in the bidet group during the 12-week study.
The reduction of ACH spend on incontinence products in feasibility and staff reports of fewer episodes of incontinence and reduction of constipation is encouraging for further work to explore capacity of the bidet in the management of bowel and bladder conditions for ACH residents.

6.5 Implications for the older person, staff and family carers

Dignity for the dependent older person was an interest of this work but was not a focus of the current research. Despite not examining the concept directly, it was still surprising that the word ‘dignity’ was used only twice across five interviews and four focus groups, given the connection between intimate personal care activities and a person’s sense of dignity, as well as the concept of dignity having increasing exposure through national and international campaigning [40-44].

Dignity, as discussed in Chapter 1, is a difficult concept to define [45, 46] and the same situation, such as the use of lifting machine to take an individual to the toilet, may be viewed as dignified (e.g. the dignity of using the toilet to void, rather than changing a pad) or undignified (e.g. being wheeled on a large machine, emphasising loss of function) by different individuals [40].

The work required of family and care staff in ACHs to clean dependent older adults after toileting requires crossing intimate personal boundaries, usually considered undignified for adults [6, 47]. However, carers described the necessity of crossing these boundaries in the task of clean up: in Chapter 3 the theme of ‘task imperative’ underscored that cleaning was a task that just had to be done, and as one staff expressed it: “We’re experienced personal carers, we don’t mind putting gloves on and assisting with bodily functions”.

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The perception that some tasks are an imperative may be a concept that subsumes dignity. That is, the necessity of the task of cleaning to avoid, odour, skin breakdown or infection for example, overrides the violation of dignity created by manual clean up. This thinking however may be grounded in the context where alternatives are not known. The bidet is an example of one such alternative that could deliver greater dignity to the toileting process. In this work, staff in particular emphasised that the use of the bidet created opportunity for greater privacy, and privacy has been emphasised as a core aspect of dignity in the delivery of personal and continence care [6, 41, 47].

Bidet use may have effects in reducing distress associated not only with toileting, but more broadly with personal care activities. Results presented in Chapter 5 give preliminary indication that there were fewer verbal or physical behaviours of concern during toileting between baseline and after 12 weeks of use of the bidet. Staff discussed the broader implications of bidet use as being able to reduce other, potentially distress inducing personal care activities, particularly through reducing the number of showers required.

For family and staff, a key finding of these studies was the reduction of toileting workload associated with the bidet. There were direct effects reported, including reduction of mental, physical and time demands as well as effort involved in the task of toileting. Downstream effects in reduction of overall workload of staff also included reports of reduction of work involved in clean up after an episode of incontinence, as well as reduction of the number of staff required for toileting.

For organisations, there is clear support for further work to better understand implications of the bidet on cost of incontinence products, staff deployment and safety, such as the potential for reduction of injury while supporting a resident to stand while cleaning. However, cost and work force implications need to be set in to context of understanding total
work flow processes. Interruption to usual work process of toileting residents using the shower commode chair at one study site demonstrated the need to place further research concerning the bidet in a context of whole-of-toileting processes.

6.6 Strengths and limitations

The studies within this body of work section have several limitations. Major limitations were the small sample sizes, lack of randomisation of participants, and threat of information bias through inconsistent exposure to the intervention or confounding effects.

The small samples in this pilot work result in lack of statistical power to detect effect and limit the generalisability of results, however the iterative nature of the work and the use of three different ACHs and one community-based setting address generalisability for aspects such as the acceptance of a novel AT.

The decision to not randomise was deliberate. Experience in the feasibility study had demonstrated that staff became invested in the study when they selected the residents they felt were the most difficult to keep clean. Staff engagement was necessary as staff were not only responsible for implementing the intervention, but also collecting the majority of data.

Lack of randomisation exposes the study to risk of selection bias [48]. Selection bias was addressed in the second phase of the work, through comparison of characteristics of participants in the bidet and control groups. No significant differences between the groups were found, except on the measure of faecal incontinence. Given the nature of the study, staff unsurprisingly more often selected residents who were faecally incontinent for the bidet intervention group. Attempts were made to reduce any potential distortion in results through analysis. For example, as between-group comparisons may have been affected by significantly higher rates of faecal incontinence in the group selected for intervention, within-group analyses
(or pre- and post-analyses), were conducted for the intervention group alone on relevant measures.

Inconsistent exposure to the intervention, or to the measurement of the outcome, or both is a risk for information bias and is avoided in clinical effectiveness trials [49]. However, inconsistency of intervention exposure is a feature of pragmatic studies that seek to understand application of interventions in real-world settings [50]. Given the large number of people involved in the delivery of the intervention, the exposure of residents to the bidet was sometimes arbitrary due to staff turnover [51], the use of casual staff or variation where bidet-trained staff were rostered to work in different areas of the participating ACH. Again, the iterative nature of the work, as well as the ability to triangulate using qualitative methods to explore and explain quantitative results meant that the findings were supported in different ways. Measures were co-designed with staff with the intent to make them simple to understand, quick to complete and used language familiar to staff. Rather than systematic bias, there is the potential for what Grimes and Schultz refer to as “non-differential misclassification, or noise in the system” [48] (p249).

Lack of blinding, either to the older person or staff was not possible due to the nature of the intervention. Lack of blinding may also have contributed to confounding variables that could mask or blur effects. For example, during pre-intervention staff training it was observed that it was the first time many staff became aware of asymptomatic bacteriuria (ASB), the frequency with which it occurs in ACH populations and how treatment of ASB with antibiotics is a major factor in the development of antimicrobial resistance. This knowledge appeared to give some staff incentive to pay greater attention to general cleanliness of the perineum of residents, whether the resident was participating in the study or not. These confounding effects have also been characterised as "Hawthorn", or clinical trial effects, where demonstrable
benefits are obtained from participating in clinical research, from non-specific effects of trial participation [52]. In future research, improved surveillance of these potential confounders, with possible subsequent statistical control, is recommended.

The studies presented in this work have external validity. Setting this work in ‘real-world’ ACHs, with differing organisational cultures is an important factor in generalisability, as is staff delivery of the intervention with a variety of residents. However, this work has focussed on bidet use with dependent older people who are reliant on assistance with toileting, so the application of the bidet with more independent older people or people receiving end-of-life care is not known, thus the study cannot claim findings are generalisable to all people living in ACHs.

This work has been exploratory and due to the pragmatic study design, lack of randomisation and statistical power, associations between bidet use and results cannot be assumed to be causal. More rigorous clinical effectiveness research with larger sample sizes are required to explore causality.

Major strengths of this work lie in its novelty and potential to improve the toileting experience of dependent older people and those who provide support. Descriptive studies in new areas of research have been described as dipping “the first scientific toe in the water” [53]. While not the first study concerning the use of an automated post-voiding washing system in older, institutionalised people, this is the first body of work investigating the bidet in Australia. The intervention is complex, comprising a number of outcomes, variability of the application of the intervention and the behaviour change required by the staff who delivered the intervention, resulting in complex interactions between components of the study [54]. A major strength of this work has been the iterative nature that has allowed identification of weaknesses and refinement of measures, procedures and adaptations to different people and contexts, as
recommended by the UK Medical Research Council’s guidance on designing and evaluating complex interventions [54]. Further refinement of measures and a focus on their validation will be necessary for future studies.

As discussed earlier, a primary strength of this body of work is its ecological validity. The use of mixed-methods was also a strength. Qualitative methods proved not only essential to explain the quantitative findings, but also to explore the methods of data gathering in sometimes challenging circumstances.

6.7 Conclusions

This exploratory work has shown that the bidet has potential to provide an effective alternative to manual post-voiding cleaning, with potential to improve the dignity of the user and to reduce family carer and care staff workload associated with toileting. There is emerging evidence that the bidet may be a useful adjunct in managing incontinence and constipation for ACH residents. There was also some evidence that bidet use reduced the cost of incontinence pads in one ACH. Improved pathology processes and appropriately powered research is required to clarify the effect of the bidet on bacterial load in the urine of residents, and its potential to affect the development of UTI. Methodological limitations could be addressed through the development of a clustered randomised trial, with the unit of randomisation at the level of the ACH site.

From a theoretical perspective, there is a paucity of work that examines the use of AT from dual perspectives of an older dependent person and a family or staff carer. This work has highlighted potential for conflict in terms of perception of benefit from different stakeholders which may limit benefit of new ATs to older dependent people and the aged care sector.
6.8 References


44. Royal College of Nursing, Defending Dignity: Opportunities and challenges for nursing Author, Editor. 2008, Royal College of Nursing: London.


## Appendix 1 – Resident Toileting Assessment

Source: HammondCare – Resident Assessment Tool

Used with permission

### Continence

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the resident have a history of incontinence of urine?</td>
<td></td>
</tr>
<tr>
<td>Does the resident have a history of faecal incontinence?</td>
<td></td>
</tr>
<tr>
<td>Does the resident have a history of constipation?</td>
<td></td>
</tr>
<tr>
<td>Does the resident have physical limitations or a medical problem contributing to incontinence?</td>
<td>Yes / No</td>
</tr>
</tbody>
</table>

If yes, please specify:

### Toileting

<table>
<thead>
<tr>
<th>Activity</th>
<th>Independent</th>
<th>Supervision / Prompting</th>
<th>Physical Assistance</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusts own clothing to use toilet / commode (lowers trousers, underpants, etc unassisted)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Positions / sits on toilet, pan or commode by self</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Cleanses self / wipes sufficiently (uses toilet paper, etc)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Wipes peri-anal area</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Adjusts own clothing after toileting / redresses (pulls up underwear, applies pad, does up fly / belt, tucks in shirt, etc)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Washes hands</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

Is a staff member present throughout this procedure to verbally / physically prompt resident and maintain safety? Yes / No

Are any continence aids used (i.e. pads / kylies)? Yes / No

If yes, please specify:

What continence management program does the resident require?

<table>
<thead>
<tr>
<th>Resident Requirement</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-dwelling catheter</td>
<td></td>
</tr>
<tr>
<td>Supra pubic catheter</td>
<td></td>
</tr>
<tr>
<td>Colostomy / Ileostomy</td>
<td></td>
</tr>
</tbody>
</table>

Comments / Additional Information
Appendix 2 – Example of 5 item Likert scale for resident

WEEK 1 of Bidet Trial  STAFF COMPLETE Form

The resident’s experience of using a wash and dry bidet

Resident Name:_____________________________ Today’s Date:__________

Rater’s Name: 1 ______________________________________________________

Rater’s Name: 2 ______________________________________________________

NB consensus must be achieved by both raters.

Instructions:

1. Observe resident immediately before, after and during operating the bidet
2. Observe:
   a. Facial expression
   b. Body language eg muscle tension; movements such as relaxing or attempting to get up from toilet
   c. Listen to vocalisation and what the residents says
   d. Note other reactions
3. Place a mark “/” on the line below that best describes the residents reaction to the bidet experience, when the bidet is operating

Scale:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appeared to dislike experience</td>
<td>A level of discomfort with the experience</td>
<td>Could not tell if resident liked the experience or not</td>
<td>A level of acceptance of the experience</td>
<td>Fully accepting of experience</td>
</tr>
</tbody>
</table>

Explanatory notes:

1. Appeared to dislike experience. e.g. tried to leave; shouts or distressed
2. A level of discomfort with the experience e.g. Initial surprised reaction; did not appear happy, but “put up” with experience, did not attempt to leave
3. Could not tell wether resident like the experience or not; e.g. no change in expression, body language or vocalisation
4. A level of acceptance of the experience e.g. Initial surprised reaction but “settled in” to experience; appeared unconcerned once settled
5. Fully accepting of experience e.g. appeared to enjoy experience or obvious feeling of benefit
Appendix 3 - Sample Toilet Data Checklist

<table>
<thead>
<tr>
<th>RESIDENT: ___________________________</th>
<th>Date: ____________</th>
<th>Time: ____________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has the resident been incontinent?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What was the void at this toilet</td>
<td>Urine</td>
<td>Faeces</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any behaviours of concern when</td>
<td>None</td>
<td>Verbal</td>
</tr>
<tr>
<td>bidet is operating?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rating of bidet for cleaning:</td>
<td>Successful clean</td>
<td>Additional wipe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>clean required</td>
</tr>
<tr>
<td>Staff strain</td>
<td>Comfortable</td>
<td>Muscle strain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was bidet not used?</td>
<td>Please state why...</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 4 - Sample Staff Briefing Presentation
WELCOME!

Please pick up the handouts.....
read and sign (if you are happy to participate)
• Imagine for a moment you have had a terrible accident and both your arms are in "aeroplane splints"

• You wouldn’t be able to do very much for yourself would you?

• Out of all the things you couldn’t do... what would be the worst thing to ask your partner, boyfriend, parent or friend to do for you?
• HammondCare (NSW), Benetas (Victoria) and the University of Sydney are running a study on electronic toilet top bidets
• We want to find out if bidets are an improvement for residents and staff in toileting
• This project is part of my PhD at the University of Sydney
Quick survey
Bidet – old French for “little pony”…
Louis-Leopold Boilly
http://commons.wikimedia.org/wiki/File:Boilly_La_Toilette_intime_ou_la_Rose_effeuillee.jpg
Modern ceramic bidet
The electronic bidet

- Warms the toilet seat
- Provides two retractable self cleaning sprays of water for front and rear cleaning
- Has a warm air dryer
The story so far....

- 2 successful projects:
  - Assistive technology project to reduce family carer strain - trial of bidets with 16 Hammond at Home clients
  - 14 residents of a high dependency, low care, XXXX Cottage at HC Woy Woy, NSW
Results

Families reported:
- bidets cleaned and dried well; reduced awkward posturing in (usually) small domestic toilet rooms
- reduced the number of pad changes in a day
- no UTIs when the bidet was used regularly
- greater dignity for client and carer
Results

- Woy Woy staff found
  - cleaned front adequately 94% of the time
  - cleaned rear adequately 79% of time
  - encouraged voiding of bladder and bowel
  - residents accepted the bidet, but it depended on staff supporting the resident
  - reduced episodes of incontinence
  - not always successful for residents with significant behavioural concerns, but sometimes surprisingly calmed residents!
So what are we doing at XXXX?

- 10 residents trialing the bidet
- 10 ‘matched’ residents receive usual care
- 12 week project
- Championed by Sushma and Amy (thanks!!)
What’s the point?

- do bidets work better than usual toileting care?
- for residents? For staff?
- do bidets reduce bacteria in urine?
- should HammondCare supply bidets for residents as normal practice….. ?
What do I need to do?

• try out the bidet in the staff toilet for yourselves!

• think about your residents and how you might go about supporting them with this experience

• assist with gathering information about how well the bidet works (weeks 1, 6 and 12, Sushma, Amy and Meredith will let you know what and when)

• assist in urine specimen collection (weeks 1, 3, 6, 9 and 12)

• participate in a 1 hour group discussion at the end of the trial – some staff only
Questions…..

- How acceptable is the bidet for residents and staff?
- How well does it clean?
- Does bidet use affect other conditions such as skin integrity? Constipation? How ‘fresh’ residents smell?
- What happens to bacteria in the urine with consistent bidet use? (could bidet use affect the number of UTIs?)
- How does it change your job of toileting residents?
- Does it affect the behaviour of residents when toileting?
- What are the costs for the facility?
- Are there are issues with installation, maintenance, operation?

- Details are at
At the end of the study

- A short survey of your experiences using the bidet
- A 45-60 min focus group discussion about your experiences, issues, problems, successes and the individual ways you may have used the bidet with residents.
Questions...

and thank you!