Received: 25 June 2023 | Revised: 24 November 2023 | Accepted: 15 January 2024

DOI: 10.1111/jan.16081

EMPIRICAL RESEARCH QUANTITATIVE

JAN Leading Global Nursing Research WILEY

Development and psychometric evaluation of an expanded urinary catheter self-management scale: A cross-sectional study

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Funding information
Westmead Charitable Trust, Grant/Award Number: 2020 Nursing & Midwifery Career Development Grant Scheme; National Health and Medical Research Council, Grant/Award Number: CF is supported by an NHMRC Investigator Grant 202; Western Sydney Local Health District, Grant/Award Number: 2018 Western Sydney Local Health District Research and 2019 Integrated and Community Health Research Laun

Abstract

Aim: To develop and test the psychometric properties of an expanded catheter self-management scale for patients with in-dwelling urinary catheters.

Design: A cross-sectional validation study. Despite the utility of the original 13-item catheter self-management scale, this instrument did not include bowel management, general hygiene and drainage bag care, which are fundamental skills in urinary catheter self-management to prevent common problems resulting in unnecessary hospital presentations. The expanded catheter self-management scale was developed with 10 additional items to comprehensively assess all five essential aspects of urinary catheter self-management.

Methods: A total of 101 adult community-dwelling patients living with indwelling urinary catheters were recruited from Western Sydney, Australia. Using exploratory factor analysis with Varimax rotation, the number of factors to be extracted from the expanded 23-item expanded catheter self-management scale was determined using a scree plot. The reliability of the overall scale and subscales was measured using

Trial and Protocol Registration: This study is registered in the Australian New Zealand Clinical Trials Registry (ACTRN12621000683831) https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=381430&showOriginal=true&isReview=true.

Cronbach's alpha. Convergent validity was assessed using Spearman's correlations between clinical characteristics, overall scale and subscales.

Results: The 23-item expanded catheter self-management scale yielded a 5-factor solution, labelled as: (i) self-monitoring of catheter function, (ii) proactive, help-seeking behaviour function, (iii) bowel self-care function, (iv) hygiene-related catheter site function and (v) drainage bag care function. Cronbach's alpha of the expanded catheter self-management scale indicating all 23 items contributed to the overall alpha value. Convergent validity results showed a negative correlation between the overall expanded catheter self-management scale and catheter-related problems.

Conclusion: The 5-factor structure provided a comprehensive assessment of key aspects of urinary catheter self-management essential to reduce the likelihood of catheter-related hospital presentations.

Implications: The expanded catheter self-management scale can be used to assess and monitor effective patient-centred interventions for optimal self-management to prevent catheter-related problems and improve the quality of life of patients.

Impact:

- Many patients start their journey of living with a urinary catheter unexpectedly and are not supported with quality information to care for their catheter.
- The findings of this study show the correlation between catheter self-management skills and catheter-related problems.
- The expanded catheter self-management scale (E-CSM) assists with analysing the self-management skills of patients living with a catheter and developing tailored interventions to prevent problems and improve their quality of life. In addition, this screening tool can be included in policies, guidelines, and care plans as a standard for improving catheter management and developing educational resources for patients.

Reporting Method: STROBE checklist was used to report all aspects of this study comprehensively and accurately.

Patient or Public Contribution: Patients living with indwelling urinary catheter and their carers have participated in surveys, interviews and co-designing interventions. This paper reports the psychometric analysis of the expanded catheter self-management scale (E-CSM) used in the patient survey as part of the main study 'Improving Quality of Life of Patients Living with Indwelling Urinary Catheters: IQ-IDC Study' (Alex et al. in *Collegian*, 29:405–413, 2021). We greatly value our consumers' contributions and continue to communicate the progress of the study to them. Their contributions will be acknowledged in all publications and presentations. In addition, all participants will be provided the option of receiving the interventions and publications generated from this study.

KEYWORDS

continence, indwelling urinary catheter, nursing, patient education, psychometric, self-management, surveys

1 | INTRODUCTION

Self-management is increasingly being recognized as a priority for patients living with chronic diseases or those living with an indwelling medical device, to manage their health condition more effectively (Ferguson et al., 2016; Wilde, Zhang, et al., 2013). Essential to this success requires improving self-management skills and understanding the changes in bodily functions including early detection of problems. To

support patients in self-management, nurses need to focus on improving patients' self-management skills which commonly include using available educational resources, partnering with other healthcare providers, action planning, and self-monitoring (Lorig & Holman, 2003).

2 | BACKGROUND

Commonly, patients living with indwelling catheters are not provided with critical information to self-manage their catheter, consequently, many depend on readily available generic online information or learn by trial and error from their own experience (Mackay et al., 2018). These approaches increase the risk of catheter-associated complications, unnecessary and costly hospital admissions including emergency department visits and adversely affect the quality of life of patients living with catheters (Prinjha et al., 2016). As a nurse working in the community setting, the importance of early detection and preventing unnecessary hospital presentations are vital. To end potentially avoidable hospital presentations, a validated screening scale is beneficial in identifying high-risk patients and to provide a more targeted self-management intervention, that will improve self-care, and mitigate the risks of possible harm.

The original catheter self-management scale (C-SMG) was developed by Wilde, McMahon, et al. (2016) to measure catheter self-management skills and the psychometric properties of this scale were tested and deemed appropriate to be used in intervention studies with long-term urinary catheter users. This 13-item validated scale was subsequently used in two interventional studies (Wilde et al., 2015; Wilde, Crean, et al., 2016). These studies confirmed the validity and reliability of this scale in measuring catheter-related symptoms among urinary catheter users. Nevertheless, three common issues, bowel management, perineal hygiene, and drainage bag care, that affect urinary catheter self-management were not included in this scale.

The development of expanded versions of existing standardized scales to improve the validity, sensitivity and specificity of self-reported instruments has previously been reported (Cinar & Yorgun, 2018; Zhang & Savalei, 2016). Expanded scales are often used to measure additional constructs to provide a comprehensive measurement, and to inform outcomes of interventions (Kyriazos & Stalikas, 2018; Streiner et al., 2015). Hence, this study developed and tested an expanded version of the catheter self-management (E-CSM) scale, which contains three additional constructs: (a) bowel management; (b) perineal hygiene and (c) drainage bag care, to ensure the scale comprehensively assesses essential aspects of the catheter self-management behaviours. This study reports on the development and psychometric testing of the E-CSM scale to include an additional 10 items to the original catheter self-management scale (C-SMG) to assess these three additional components.

Items included in bowel management, perineal hygiene and drainage bag care were carefully developed based on the findings from literature reviews (Alex et al., 2020, 2022), clinical findings and extensive clinical experience of the first author. In addition, these items were also reviewed by a panel of experts in urology and continence nurse specialists, and consultant nurses working in both hospital and community settings, and necessary modifications were made to the items based on their feedback. The panel emphasized the importance of including items that are relevant to those who are often frail, older, or have disabilities and are more prone to develop constipation due to less fibre and fluid consumption and due to their reduced mobility. This is because many of these patients often rely on their carers to assist with their care including hygiene around the catheter site and drainage bag care. Hence, obtaining personalized information related to how patients manage their bowel movements, personal hygiene and drainage bag care will assist in developing tailored interventions to prevent common catheter-related problems such as urinary tract infections, urine leakage and catheter blockages.

2.1 | Bowel management

Constipation can cause pressure on the bladder and may lead to catheter blockages (Payne, 2021). In addition, constipation in catheterised patients has an increased risk of developing catheter-associated urinary tract infection (CAUTI) including purple bag syndrome, a purple urine discolouration linked to constipation (Reid et al., 2021). Constipation can also cause urine to leak around the catheter site, bypassing the catheter lumen as the pressure from the loaded bowel can partially occlude the catheter (Agency for Clinical Innovation, 2017; Mitchell, 2008).

2.2 | Perineal hygiene

Urinary tract infection (UTI) has been repeatedly shown to be associated with poor perineal hygiene (Leaver, 2007; Murphy et al., 2018) and daily hygiene around the meatal region has been shown to reduce this infection (Coventry et al., 2021; Musco et al., 2022; Seyhan & Özbaş, 2018). To prevent UTI, the National Institute of Clinical Excellence (NICE) and Agency for Clinical Innovation (2017) recommend cleaning the perineum and meatus with soap and water as part of daily catheter care, and advise nurses to educate patients regarding perineal hygiene as some of the patients may be anxious and wary of touching the catheter due to fear of causing pain and dislodgement (Leaver, 2007; Reid et al., 2021). Daily hygiene around the catheter insertion site is essential to prevent the build-up of mucus encrustation around the meatus and to avoid pain and irritation (Payne, 2021).

2.3 | Drainage bag care

Previous studies (Ostaszkiewicz & Paterson, 2012; Wilde, Fader, et al., 2013) reported that 68% of nurses recommended reuse and cleaning of the urine drainage bags. In addition, these studies also alluded to the inconsistency of recommending decontamination

methods for urine drainage bags and the lack of adherence to manufactures' guidelines. Selecting the appropriate drainage system, care and management are vital in avoiding catheter-related problems, preserving renal health and improving patient comfort (Robinson, 2006). A range of drainage systems are available, to cater for different patient's needs and medical requirements. Therefore, it is important to help patients select and care for the drainage system that best suits them and more importantly, follow the manufacturer's guidelines for the usage and handling of the product.

3 | METHODS

3.1 | Design

In this study, we expanded from the 13-item self-management (C-SMG) scale developed by Wilde, McMahon, et al. (2016) to include an additional 10 items related to bowel assessment, hygiene, and urinary drainage bag care, based on the current evidence of Coventry et al. (2021), Murphy et al. (2018) and Payne (2021). The response format of the expanded catheter self-management scale is consistent with C-SMG scale responses using a five-point scale assessing the occurrence of behaviour (0 = do not do this, 1 = monthly or less often, 2 = several times a month, 3 = weekly, 4 = several times a week, 5 = several times a day or daily).

3.2 | Settings

This study was undertaken in a large health district in the Western Sydney region in New South Wales, Australia in 2020–2021. This project was postponed for approximately 8 months due to the COVID-19 outbreak. Western Sydney region is one of the most culturally diverse communities and we had participants from different cultural and ethnic backgrounds.

3.3 | Development of the E-CSM

3.3.1 | Item contextualisation and item generation

As part of the main study 'Improving Quality of Life of Patients Living with Indwelling Urinary Catheters: IQ-IDC Study' (Alex et al., 2021), we used the expanded catheter self-management scale (E-CSM) developed from the C-SMG scale to analyse the self-management behaviours and correlations of catheter-associated problems. Minor editorial changes were made to the two items in the C-SMG scale to adapt it to the target population to enhance specificity and clarity and contextualizing the scale to include culturally and linguistically diverse patients to improve readability and comprehension (Spritzer et al., 2022). The expanded catheter self-management scale (E-CSM) consists of 23 items with five constructs assessing the occurrence of behaviours in (i) Self-monitoring of catheter function, (ii) Proactive, help-seeking behaviour function, (iii) Bowel self-care function, (iv) Hygiene-related catheter site function and (v) Drainage Bag care function. The additional 3 constructs were generated by the researchers based on the comprehensive review of the literature related to the assessment and management of catheter-associated complications. The C-SMG scale was tested for psychometric appropriateness, and used in a randomized clinical trial (Wilde, McMahon, et al., 2016). Reliability testing (Cronbach's alpha) of the C-SMG scale was satisfactory, and the confirmatory factor analysis was adequate and deemed appropriate to be used in intervention research with IDC users.

3.3.2 | Face validity and pilot testing

Five patients living with a urinary catheter reviewed the items for appropriateness and relevance in assessing each dimension of the catheter self-management behaviours. The comments from the consumers included editorial changes, (e.g. 'proficient' was changed to 'good', and 'embarrassment' was changed to 'shyness'), changes in response format to improve clarity, avoiding jargon and medical terms (e.g. 'stool' was changed to 'poo', 'urine bypassing' was changed to 'urine leakage') to improve readability and understandability of these items. Furthermore, one consumer suggested reviewing the structure of some questions and re-phrasing the questions differently to improve the personalisation, visual design and reduce ambiguity to lessen the time required to complete it. Based on the information provided, the research team considered their comments and made necessary modifications to the scale and deleted items, if duplicated with other items. The updated scale was piloted with five catheter users from culturally and linguistically diverse backgrounds to assess readability, comprehension and cultural sensitivity. Additional modifications were made to the scale based on their feedback and recommendations to improve the comprehensibility of the items (Figure 1).

3.4 | Psychometric evaluation of the E-CSM

3.4.1 | Participants

All participants were adults living in the community with indwelling urinary catheters (suprapubic or urethral catheters). Initially, participants were recruited at the time of their routine catheter changes in the community nursing clinics, however, recruitment was extended to home-visiting patients. Informed verbal consent was obtained from all participants. Patients were included if they met the following criteria; adult patients (18 years and over), living with an indwelling urinary catheter in the community, and attended by nurses in the WSLHD Integrated and Community Health Services for their routine catheter changes. Patients using intermittent self-catheterisation, paediatric patients <18 years and patients with cognitive impairment or mental health conditions clinically diagnosed and recorded on their electronic medical records were excluded.

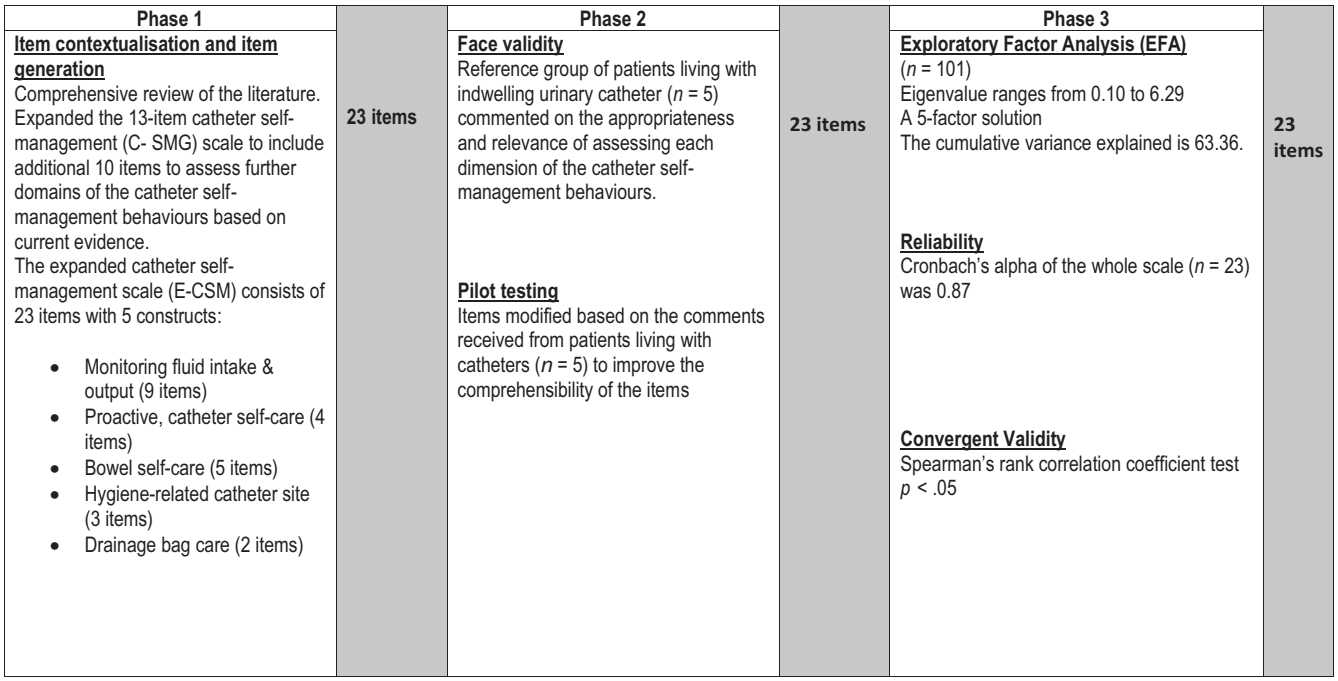

FIGURE 1 Phases of development of the Expanded Catheter Self-management (E-CSM) scale.

Determining the sample size for the exploratory factor analysis of this study was based on the number of variables, the complexity of the factor structure, and the desired level of statistical power. The study of Bujang et al. (2012) recommends that the minimum sample size required is three per variable for response formats that have four items or more. Therefore, in this study, the minimum sample size for exploratory factor analysis is 1:3 per variable and the minimum sample size required for a 23-item scale is 69 samples as this study used a six-point Likert scale (Bujang et al., 2012). The Kaiser-Meyer-Olkin measure of sampling adequacy of the 23-items E-CSM scale was 0.738 indicating that the sample size of this study is sufficient for exploratory factor analysis (EFA).

3.4.2 | Instruments

C-SMG scale developed by Wilde, McMahon, et al. (2016) contains 13 items with 3 constructs: fluid intake and output, prevent catheter problems and communication. Although the original response format was a 5-point scale (0 = do not do this, 1 = monthly or less often, 2 = several times a month, 3 = weekly, 4 = several times a week, 5 = several times a day or daily) this was changed to a simplified 3 category ordinal scale (1 = not at all, 2 = sometimes, and 3 = most or all of the time).

In the expanded 23 item E-CSM scale, three additional constructs were added to include items related to bowel management, drainage bag care and hygiene. The E-CSM scale used a 5-point response scale to compare the psychometric properties as recommended by Wilde, McMahon, et al. (2016).

3.4.3 | Data collection

Initially, participants were recruited from the Western Sydney community nursing clinics at the time of their routine catheter changes. Posters with study information were displayed in the five community health centres along with blank paper surveys and the drop box to return the completed survey. A prepaid envelope was also provided for participants to return the completed survey via post. Ethics amendments were sought after the COVID-19 outbreak to include home-visiting patients in this study and to call and administer the questionnaire over the phone for those who were agreeable to being contacted by a research team member. Research Electronic Data Capture (REDCap™) (Harris et al., 2009, 2019) database was used to manage the survey data collected for data analysis purposes.

3.4.4 | Data analysis

The SPSS version 25 was used to perform all data analysis. Nominal and ordinal data were summarized using frequencies and percentages, while continuous data were summarized using mean, standard deviation and ranges. Using the Principal Axis Factoring procedure with listwise deletion for missing data, the 23-item scale was subjected to exploratory factor analysis (EFA) with Varimax rotation. Appropriateness for factor analysis of the 23-item E-CSM scale was examined using the Kaiser-Meyer-Olkin measure of sampling adequacy. The number of factors was determined using a scree plot and eigenvalues of each factor. The reliability of the overall scale and subscales were measured using Cronbach's alpha. As the aggregate scores of the E-CSM subscales

were shown to be not normally distributed using the one-sample Kolmogorov–Smirnov test, Spearman's rank correlation coefficient test was used to analyse the convergent validity. The statistical significance threshold for the *p*-value was set to less than .05.

3.5 | Ethical considerations

Informed verbal consent was obtained from all participants before study enrolment. This was an anonymous survey, and all participants were de-identified. This study was approved by the Western Sydney Local Health District (HREC/2019/ETH12575) and the Western Sydney University Research Ethics Committee (RH13650). In addition, this study is registered in the Australian New Zealand Clinical Trials Registry (ACTRN12621000683831). All research team members have completed the Good Clinical Practice (GCP) training as per the Research Ethics Committee guidelines.

4 | RESULTS

4.1 | Characteristics of the sample

Of the 101 participants who completed the survey, one survey was not included in the data analysis due to non-completion of the survey. Demographic and clinical characteristics of the sample are recorded in Table 1. Interestingly, 80% of the study population had complete confidence in English language proficiency. In addition. 34.3% of the study participants reported complete confidence in using a smartphone or a computer, 32.3% had no confidence and the remaining participants only had some confidence.

4.2 | Factorial validity-exploratory factor analysis

The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.74 indicating that the 23-item scale was factorable with meritorious intercorrelations among the items (Comrey & Lee, 2013). Five factors were identified using scree plots and Eigenvalues, accounting for 63.4% of the total explained variance. These factors of the E-CSM scale were labelled as: (i) self-monitoring of catheter function, (ii) proactive, help-seeking behaviour function, (iii) bowel self-care function, (iv) hygiene-related catheter site function and (v) drainage bag care function. The result of this study supports the five-factor structure of the expanded E-CSM scale and subscales with good internal consistency. Each factor loading ranged from 0.40 to 0.86. Factor loading of the E-CSM scale is recorded in Table 2.

4.3 | Reliability

Internal consistency of the 23-item E-CSM scale and the subscales were computed using Cronbach's alpha. The overall Cronbach's alpha of the whole scale ($n = 23$) was 0.87 while the values of each of the subscales were: (i) Self-monitoring of catheter function 0.82 ($n = 9$); (ii) Proactive, help-seeking behaviour function 0.78 ($n = 4$); (iii) Bowel self-care function 0.87 ($n = 5$); (iv) Hygiene related catheter site function 0.82 ($n = 3$) and (v) Drainage bag care function 0.75 ($n = 2$).

TABLE 1 Demographic and clinical characteristics of sample ($n = 100$).

Variable	Percent
Age	
18–55 years	12
56–75 years	29
>75 years	59
Sex	
Male	75
Female	25
Education level	
Up to high school	53
Above high school	46
Other	1
Number of years of living with a catheter	
Less than 1 year	29
1 year to less than 5 years	37
5 years and over	33
Missing data	1
Information received on how to care for the catheter	
Yes	64
No	30
Not sure	6
Patients had catheter-related problems	
Yes	75
No	25
Types of catheter-related problems[a]	
Catheter-associated urinary tract infection (CAUTI)	65
Bleeding	49
Urine bypassing (leaking) around the catheter	45
Catheter blockage	45
Pain	38
Catheter dislodgement	16
Number of hospital presentations in the last 12 months because of a catheter-related problem	
Never	43
Not in the last 12 months	11
1–2 times	29
3 times or more	14
Missing data	3

[a]Categories not mutually exclusive, some reported more than one type of problem.

TABLE 2 Factor loading of the E-CSM scale ($n = 100$).

Items	Communality	Factor loading
Five-factor solution (Total explained variance: 63.4%)		
Factor 1: Self-monitoring of catheter function (Eigenvalue 6.289, Cronbach's alpha = 0.82)		
19. Watch to be sure your catheter is positioned correctly	0.69	0.80
20. Make sure your urine bag and tubing are positioned correctly	0.69	0.70
17. Keep track of the colour and the amount of your urine (pee)	0.49	0.69
18. Make changes in types and amounts of fluids depending on urine (pee)	0.50	0.60
14. Pay attention to the amount of fluids you drink	0.52	0.52
15. Keep track of the fluids you drink	0.54	0.46
16. Pay attention to the types of fluids you drink	0.58	0.45
21. Pay attention to early signs of urinary tract infection	0.64	0.37
22. Pay attention to early signs of catheter blockage	0.64	0.32
Factor 2: Proactive, help-seeking behaviour function (Eigenvalue 2.520, Cronbach's alpha = 0.78)		
23. Ask the healthcare provider to make changes in catheter care or management	0.62	0.77
25. Talk with other people to get help or support when the catheter is causing problems	0.57	0.69
26. Ask for pain medication after a catheter change if needed	0.65	0.66
24. Plan for going out of the house by knowing where the bathrooms are and how to empty the bag	0.46	0.63
Factor 3: Bowel self-care function (Eigenvalue 2.138, Cronbach's alpha = 0.87)		
36. Take action when you have to strain to open your bowels	0.78	0.86
37. Take action when your bowels have not been opened for a few days	0.76	0.85
34. Take action when you have hard or lumpy stool (poo)	0.80	0.84
35. Take action when you have runny stool (poo) or diarrhoea	0.70	0.70
33. Take note of the appearance of your stool (poo)	0.49	0.79
Factor 4: Hygiene-related catheter site function (Eigenvalue 1.973, Cronbach's alpha = 0.82)		
29. Check to make sure that the catheter site is dried at all times	0.79	0.88
27. Pay special attention to clean the catheter site (area where the catheter is inserted into your body) when you have a bath or a shower	0.77	0.85
28. Clean the catheter site with soap and water	0.72	0.82
Factor 5: Drainage Bag care function (Eigenvalue 1.652, Cronbach's alpha = 0.75)		
30. Empty the catheter bag when it is half to three-quarter full	0.53	0.69
32. Replace your drainage bag with a new one	0.64	0.69

4.4 | Convergent validity: Self-management and catheter-related problems

Catheter problems were measured by collecting information on the type of catheter-related problems experienced by patients including catheter blockages, bleeding, pain, urine bypassing (leaking) around the catheter, catheter dislodgement, number of urinary tract infections and antibiotics usage. In addition, the number of times the patient accessed health services (Hospital, Medical centre/General Practitioner, Urologist, or Community nursing services) in the last 1 and 5 years was measured.

Convergent validity testing was conducted to demonstrate that the measures that were theoretically related to measuring the same constructs were correlated. Spearman's rank correlation coefficient test was conducted to examine the interrelation of the variables, with magnitude of the relationships between the overall E-CSM scale, subscales of: (a) Monitoring fluid intake and output; (b) Proactive catheter self-care; (c) Hygiene-related catheter site; (d) Drainage bag care, and variables of interest. The data demonstrated a negative correlation between the overall expanded catheter self-management scale (E-CSM) and catheter-related problems ($r = -0.2$, $p < .05$). In addition, the correlation was observed between catheter-related problems and the E-CSM subscales of self-monitoring of catheter function, proactive, help-seeking behaviour function, hygiene-related catheter site function and drainage bag care function.

4.4.1 | Self-monitoring of catheter function

A positive correlation was associated with the E-CSM subscale of monitoring fluid intake and output and the number of years of living

with the catheter ($r=0.28$, $p<.005$). In addition, a negative correlation was also identified between the E-CSM subscale of monitoring fluid intake and output and catheter-related problems ($r=-0.26$, $p<.009$) specific to catheter-associated bleeding ($r=-0.23$, $p<.02$). The hypothesis formulated based on theoretical expectations would be that the participants who have a longer duration of living with the catheter would have developed better self-monitoring of the catheter function and watching their fluid intake and output. In addition, this study also found that participants who paid less attention to self-monitoring of their catheter function especially, the fluid intake and output had an increased number of catheter-related problems.

4.4.2 | Proactive, help-seeking behaviour function

A negative correlation was observed between another E-CSM subscale of proactive catheter self-care and catheter blockages ($r=-0.2$, $p<.05$). This frames the hypothesis that those who are not proactive with catheter self-care had higher incidents of catheter blockages.

4.4.3 | Hygiene-related catheter site function

In this study, the data demonstrated a positive correlation between the E-CSM subscale of hygiene-related catheter site and catheter-related problems ($r=0.24$, $p<.02$) and more specifically catheter-related infection ($r=0.31$, $p<.002$). The hypothesis based on these findings would be that the patients who had catheter-related problems, especially CAUTI had learned the importance of hygiene and being proactive in caring for their catheter.

4.4.4 | Drainage bag care function

A positive correlation was identified again between another E-CSM subscale of drainage bag care and the number of CAUTIs ($r=0.35$, $p<.001$). In addition, this E-CSM subscale of drainage bag care was also correlated with catheter-related problems such as urine leakage or bypassing around the catheter ($r=0.31$, $p<.002$); catheter blockage ($r=0.21$, $p<.04$), and pain ($r=0.2$, $p<.05$). These relationships between the variables indicate the hypothesis of the lived experience of patients to modify their drainage bag care practices and comply with manufacturer user guidelines to prevent catheter-related problems including CAUTI.

5 | DISCUSSION

There are several measures for self-management of urinary catheters to ensure good catheter self-care, improve comfort and minimize the risk of catheter-related infections and complications. The original catheter self-management scale (C-SMG) included items to measure fluid intake and output, prevent catheter-related problems and communications. The expanded version of the E-CSM scale was developed to assess additional dimensions to provide more precise and comprehensive assessments of effective interventions related to bowel management, drainage bag care and hygiene. Results of both factor analysis and Cronbach's alpha values of the subscales clearly showed that the expanded 23-item E-CSM scale consisted of a 5-factor structure and provided a more comprehensive assessment of constructs that were being measured.

The demographic characteristics of the sample of older men in our study were similar to the findings of Giles et al. (2019), possibly due to the high prevalence of benign prostate enlargement and obstructive uropathy among older men (Feneley et al., 2015; Godfrey, 2008; Mackay et al., 2018; Prinjha et al., 2016). Interestingly, nearly half of the participants obtained above a high school level of education, the rest of the sample received only up to a high school level of education, underscoring the importance of checking the readability and understandability of the interventions and resources developed for people in this target group. In addition, this study was conducted in an area with many immigrants from different countries and cultural backgrounds. To generalize the items to a broader population, face validity of the tool was conducted with participants from different cultural and linguistic backgrounds. This helped to incorporate the cultural, social, and economic contexts of the diversity of the population and develop a culturally safe tool. In addition, interdisciplinary collaboration of clinical experts and engagement of consumers representing the study population assisted in this study to account for the complexities of diverse populations.

Importantly, the findings of this study showed a negative relationship between catheter self-management as assessed by the E-CSM scale and lower levels of monitoring for: (a) fluid intake; (b) catheter-related bleeding and (c) catheter blockages. These results confirmed previous findings by Prinjha et al. (2016), Waskiewicz et al. (2019) and Wilde, Zhang, et al. (2013) and explained the increased risk of catheter-related problems for those who were less proactive in catheter care and self-management. Notably, a negative correlation was shown between the number of hospital presentations for a urinary tract infection and hygiene-related catheter site highlighting the potential benefits of using the E-CSM scale as a screening tool to identify those at risk of higher health service utilization due to lower levels of urinary catheter self-care management. This justifies educational interventions to improve catheter self-management in this cohort of patients and where education interventions should focus to gain patients the most benefits.

In the current study, respondents living with the catheter for 1 year or more reported high levels of awareness for monitoring fluid intake. Similarly, they were also more cautious about drainage bag care, were more likely to have had a history of increased infection rates in the past, catheter blockages, urine leakage or bypassing around the catheter and catheter-related problems. This positive correlation explained the importance of having knowledge about drainage bag care in minimizing catheter-associated urinary tract infections (CAUTI) based on the lived experience of catheter users.

Interestingly, the data also showed a weak positive correlation between catheter-related problems and hygiene-related catheter care perhaps demonstrating the evidence of participants learning from their experience (Prinjha et al., 2016) and increased adherence to the repeated instructions given by the healthcare providers as the majority of the study participants were living with a catheter for more than 1 year.

5.1 | Limitations

This study was conducted in the Western Sydney region of Australia and included adult patients living in the community with indwelling urinary catheters. While 12 participants were below 55 years of age, issues regarding urinary catheter self-management in the younger cohort may need to be explored further. In addition, we have excluded patients with cognitive impairments and intermittent self-catheter users, which may have contributed to the small sample size.

6 | CONCLUSION

The important finding of this study was that the E-CSM scale is a reliable scale in measuring self-management behaviours required for patients with a catheter to live life well and minimize potential catheter-associated problems. Different to the original catheter self-management scale (C-SMG), the expanded E-CSM scale added 3 additional constructs to include items related to comprehensive catheter self-management behaviours which were missing in the original scale. The E-CSM scale can be used to explore self-monitoring practices and self-management behaviours of patients living with catheters. The valid psychometric properties of this scale make it a reliable resource for developing effective catheter self-management interventions which are tailored to the needs of the targeted population. In addition, this scale will also help understand catheter users' self-management behaviours and the effectiveness of interventions in improving patient outcomes.

7 | RELEVANCE TO CLINICAL PRACTICE

In general, addressing the information needs of patients and assisting them to self-manage their catheter will help them to adjust to life with a catheter and prevent problems. The expanded E-CSM scale is a comprehensive scale and has potential benefits as a screening tool to identify patients who are at increased risk of urinary catheter-related hospital presentations and can be used in developing policies, guidelines, care plans and resources as part of patient education to improve catheter self-management. Furthermore, the expanded tool will assist with monitoring the self-management behaviours of patients and help to deliver individualized catheter care and patient education tailored to their needs. The additional constructs of bowel management, drainage bag care and hygiene, will measure comprehensive catheter self-management behaviours which were missing in the original scale.

The items included in the bowel management will help to identify the risk of constipation which often leads to abdominal distention and pressure on the bladder potentially contributing to urine leakage, obstruction or dislodgement of the catheter. Similarly, the items related to perineal hygiene help to identify the risk of urinary tract infection as the catheter becomes the channel for bacteria to migrate from the perineal area to the urinary tract. The items related to drainage bag care identify the risk of urinary stasis which leads to the formation of crystals and sediments, catheter blockages and increased risk of UTI. In summary, the expanded E-CSM scale has potential clinical and research implications in developing effective catheter self-management interventions to help reduce preventable catheter-related problems and avoidable antibiotic use.

Although the high proportion of the sample size is above 75 years old, the reason we excluded cognitively impaired clients is due to the difficulty of alternate options to obtain informed consent to the study while COVID-19 restrictions were in place. Another reason is cognitive impairments can encumber patients' ability to comprehend catheter self-management, which is the main focus of this study.

8 | FUTURE DIRECTIONS

In future directions, translation of the scale and cultural adaptation of the scale may be appropriate, given the Western Sydney demographic. Subsequent studies may carefully consider including people with cognitive impairment.

AUTHOR CONTRIBUTIONS

JA, LR, CF, JM and YS were responsible for the study conception and design. JA, YS and DM conducted the data analysis and consulted LR and CF to reach a consensus. JA, DM, YS developed the tables and figures and reviewed them by LR, CF and JM. JA, DM, and YS were responsible for drafting the manuscript. All authors (JA, DM, YS, CF, LR and JM) made critical revisions for important intellectual content and written permission was obtained to include the finding sources of all authors. We confirm that any data utilized in the submitted manuscript have been lawfully acquired in accordance with the Nagoya protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization of the convention on biological diversity. All authors have checked to make sure that our submission conforms as applicable to the Journal's statistical guidelines and Professor Yenna Salamonson has expertise in survey construction, psychometric assessment and statistics and provided statistical oversight for this study.

ACKNOWLEDGEMENTS

We thank Professor Emeritus Mary H. Wilde, PhD, RN, University of Rochester, School of Nursing, for giving us permission to use the catheter self-management scale and acknowledge her contributions in this area of research. This study was supported by the University

of Wollongong and Western Sydney Local Health District. In addition, we thank Centre for Chronic and Complex Care Research and Research & Education Network for their assistance and support. Finally, we would like to show our gratitude to our General Manager, Directors of Nursing, Nurse Manager and Nursing Colleagues for supporting and sharing their pearls of wisdom with us during this research. Open access publishing facilitated by University of Wollongong, as part of the Wiley - University of Wollongong agreement via the Council of Australian University Librarians.

FUNDING INFORMATION

JA is funded through a 2018 Western Sydney Local Health District Research & Education Network Nursing & Midwifery Kickstarter Grant, a 2019 Integrated and Community Health Research Launchpad Grant and a 2020 Westmead Charitable Trust Nursing & Midwifery Career Development Grant. CF receives funding from the National Health and Medical Research Council Investigator Grant 2020–2025 (APP1196262).

CONFLICT OF INTEREST STATEMENT

No conflict of interest has been declared by the authors.

PEER REVIEW

The peer review history for this article is available at https://www.webofscience.com/api/gateway/wos/peer-review/10.1111/jan.16081.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

Informed verbal consent was obtained from all participants before study enrolment. This was an anonymous survey, and all participants were de-identified. This study was approved by the Western Sydney Local Health District (HREC/2019/ETH12575) and the Western Sydney University Research Ethics Committee (RH13650). In addition, this study is registered in the Australian New Zealand Clinical Trials Registry (ACTRN12621000683831). All research team members have completed the Good Clinical Practice (GCP) training as per the Research Ethics Committee guidelines.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Alex, J., Ferguson, C., Ramjan, L. M., Maneze, D., Montayre, J., & Salamonson, Y. (2024). Development and psychometric evaluation of an expanded urinary catheter self-management scale: A cross-sectional study. *Journal of Advanced Nursing*, *80*, 3199–3210. https://doi.org/10.1111/jan.16081