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Predictors of Patient Participation in Pressure Injury Prevention: An Observational Substudy

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ABSTRACT

Patient participation improves patient outcomes, but factors that predict participation in pressure injury prevention (PIP) are relatively unknown. This study aimed to identify patient-related factors predictive of patient participation in pressure injury prevention (PPPIP) in hospitalised medical and surgical patients and to assess the psychometric properties of the PPPIP scale. This observational substudy recruited consenting adults at risk of pressure who participated in a parent trial. The seven-item PPPIP scale was administered within 48 h of recruitment, with higher scores reflecting more participation. Multiple regression was used to identify patient-related factors predictive of patient participation. The scale's psychometric properties were assessed using confirmatory factor analysis and Cronbach's alpha. In total, usable data were obtained from 856 patients. Mean PPPIP scale scores were relatively high, with 571 (66.7%) scores reflecting agreement or strong agreement. The Cronbach's alpha was 0.81, and most confirmatory factor analysis criteria for construct validity were met. Only the use of mobility aids was statistically significant in the model, but it predicted a small amount of variability in PPPIP score (adjusted $R^2 = 0.017$; $p < 0.001$). Targeting patients with limited mobility may be a useful strategy when trying to engage patients in PIP if resources are limited.

1 | Introduction

Patient participation, also referred to as patient engagement [1], is a fundamental component of patient centred care [2] and has been part of the quality and safety agenda for decades [3–5]. There is a growing body of evidence that patient participation in care improves patient outcomes [6–9] and healthcare experiences [9]. Pressure injuries (PI) are an outcome sensitive to nursing care [10–12], and their prevention is an area advocated as an opportunity to promote patient participation [13, 14]. Nurses are primarily responsible for PI prevention (PIP) yet there is limited understanding of the factors that influence participation in PIP. This study focused specifically on patient-related factors that predict their participation in PIP.

Patient participation in PIP (PPPIP) studies methods have included qualitative interviews [15], observations [16, 17] and a quantitative survey [14]. This participation has also been an outcome when testing interventions [18–20]. Latimer, Chaboyer [15] interviews with 20 adults in medical wards in one hospital showed patients wanted a proactive role in PIP, but their limited understanding of PI and negative interactions with nurses ultimately led to disengagement. McInnes, Chaboyer [16] small study of medical and surgical patients in one hospital showed the vast majority understood what PI was and thought they had a role in prevention. Chaboyer, Harbeck [14] developed and tested a 7-item scale to measure PPPIP, which has since been used in three before and after intervention studies: two testing the effect of patient education [18, 20] and the third evaluating

Key Points

- Patient participation, also referred to as patient engagement, is an important component of patient-centred care.
- Patient participation in care has been found to improve patients' clinical outcomes, however the factors that predict patient participation in pressure injury prevention (PIP) are unknown.
- This study aimed to identify patient-related factors that predict patient participation in PIP care.
- This observational study recruited adults who were at risk of developing a pressure injury (PI) who participated in a larger randomised controlled trial.
- A validated seven-item scale was administered within 48 h of recruitment, with higher scores reflecting greater patient participation.
- Multiple regression was used to identify patient factors predictive of patient participation. Only the use of mobility aids was statistically significant, and predicted a modest amount of variance in patient participation scores (adjusted $R^2 = 0.017$; $p < 0.001$).
- In this study, the scale's psychometric properties were found to be acceptable.

a PIP care bundle that included patient education [19]. All three studies were single-site with sample sizes ranging from 61–153, and all three showed their interventions improved PPPIP. Thus, a better understanding of PPPIP is emerging although most studies have been small.

There is limited understanding of what predicts PPPIP although factors such as age and education [8, 21, 22], and independence in care [21, 23, 24] have been associated with patient participation in general nursing care. This current study aimed to identify patient-related factors predictive of PPPIP in hospitalised medical and surgical adults at risk of pressure injury. We hypothesised that five patient characteristics (age, gender, number of comorbidities, medical versus surgical and use of mobility aids) and three pressure injury-related characteristics (Waterlow risk assessment score, receiving PIP education and intervention/control group membership) would predict PPPIP scores. Because the scale is relatively new and its psychometric properties have only been comprehensively assessed in one study [14], a secondary aim was to assess the psychometric properties of the PPPIP scale. Understanding the factors that contribute to patients' participation in PIP will provide a solid foundation upon which to develop strategies to promote more active patient engagement in their PIP care.

2 | Design

This was an observational substudy of hospitalised medical and surgical adults at risk of PI who participated in a larger multi-site PIP randomised controlled trial (ANZCTR ACTRN12619000763145) of a prophylactic sacral dressing [25]. Participants in the intervention and control groups completed the PPPIP scale. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [26] guided the reporting of this study.

3 | Methods

3.1 | Sample

The parent trial inclusion criteria were adults admitted in the previous 36 h to medical and surgical units of three large metropolitan hospitals, whose expected hospital length of stay was greater than 24 h and who were at high risk for a PI. In the state where the study took place, hospitals used the Waterlow scale as a risk assessment tool. Therefore, patients at risk of PI were defined as either a Waterlow score of ≥ 10 or patients who had limited mobility. Patients were excluded if they were unable to be turned, had an existing sacral PI or other lesion in the sacral area at the time of recruitment, had urinary or faecal incontinence at the time of recruitment, or were unable to speak or understand English if no interpreter was present. When individuals are incontinent, the dressing manufacturer recommends a different process for dressing application, which introduces a difference in the way the dressings are applied within the intervention group. Therefore, the parent trial excluded patients with incontinence. All participants in the parent trial were included in this analysis. A power analysis showed that with eight predictors, a sample size of 766 would have > 95% power to detect a small effect (0.03) with an alpha of $p < 0.05$ [27]. This sample size also allows us to assess the scale's psychometric properties.

3.2 | Instrument

The PPPIP scale is a 7-item scale with response options of 1 (strongly disagree) to 4 (strongly agree) [14]. A total scale score is calculated, with possible scores ranging from 7 to 28 and higher scores representing greater participation. A previous confirmatory factor analysis supported a one-factor solution and a Cronbach's alpha of 0.86 in a previous study [14]. However, one other small study of 80 hospitalised adults found that Cronbach's alphas were 0.52 and 0.62 before and after an intervention [19]. Given this, we also assessed the scale's psychometric properties as part of this current trial.

3.3 | Data Collection

The PPPIP scale was administered by a research nurse at each study site within 48 h following study recruitment. To limit non-response bias, if participants were not available to complete the scale on day one, the research nurses returned later in the day or the following morning to collect the data. Other data at baseline included participant demographic and clinical characteristics along with PI-related variables such as Waterlow risk assessment score (calculated by the research nurse on trial screening), if participants received PIP information (determined by asking the patient at baseline), recording a yes or no response and their randomised group allocation. All data were collected between 13 July 2020 and 22 June 2023 and entered directly into the Research Electronic Data Capture (REDCap) [28].

3.4 | Data Analysis

Data were first exported from REDCap to IBM SPSS Statistics and AMOS version 29 (IBM, Chicago, IL, USA). Data were cleaned and 10% checked for accuracy; missing data were not replaced. Descriptive statistics were used to summarise the characteristics of the sample. Absolute and relative frequencies were used to summarise categorical variables and mean and standard deviation (SD) or median and interquartile range (IQR) were used for continuous variables, depending on the data distribution. Cronbach's alpha and confirmatory factor analysis were used to evaluate the scale's internal consistency reliability and construct validity, which were assessed against a standard set of criteria [29, 30].

After assumption checking, a correlation matrix was created to identify bivariate associations between the eight predictor variables (age, gender, number of comorbidities, medical vs. surgical, use of mobility aids, Waterlow score, receiving PIP information, and intervention/control group membership) and the scale score. Multivariable linear regression using a model-building approach was used to identify predictors of scale scores. Factors that met the significance criteria of $p < 0.20$ were then entered into the multivariable regression.

4 | Results

4.1 | Characteristics of the Sample

Figure 1 contains the CONSORT flow chart of the patients in the parent trial and those in the observational substudy. In total, 868 of the 954 (91%) patients who were randomised in the parent trial completed the PPPIP scale. Eighty-six patients did not complete the scale because they were discharged before data could be collected or declined completion. Twelve patients were removed during initial analysis, 10 because of missing data that could not be replaced and two because they were outliers, leaving 856 responses (98.6% of 868) for all analyses.

Table 1 summarises the characteristics of the sample and the subgroups of control and intervention, which did not differ significantly on predictors or PPPIP scale scores. Data were available for all 856 participants for all variables except hospital length of stay where it was missing for 6 (0.07%) of patients. Participants were older adults who had about two comorbidities and stayed in hospital for about a week. All were at risk to very high risk of PI, and almost two thirds were male surgical patients. Only about 1 in 20 reported receiving PIP education and about 30% used a mobility aid. The average total PPPIP scale scores were relatively high at 22.6 (SD 4.4) given the possible score range of 7–28, with $n = 571$ (66.7%) scores reflecting agreement or strong agreement.

Table 2 displays the psychometric testing of the PPPIP scale. Most model fit statistics were met except for the normed chi-square and root mean square error of approximation.

Table A1 shows the correlation matrix for the eight predictors and the PPPIP scale. Correlations were very weak, and most did not reach statistical significance. Two predictors were associated with the PPPIP scale score at $p < 0.05$; the use of mobility aids and the Waterlow PI risk assessment score. Amongst the predictors, six associations were significant, three with the Waterlow PI risk assessment score (use of mobility aids, age and number of comorbidities), two with admission type (use of mobility aids

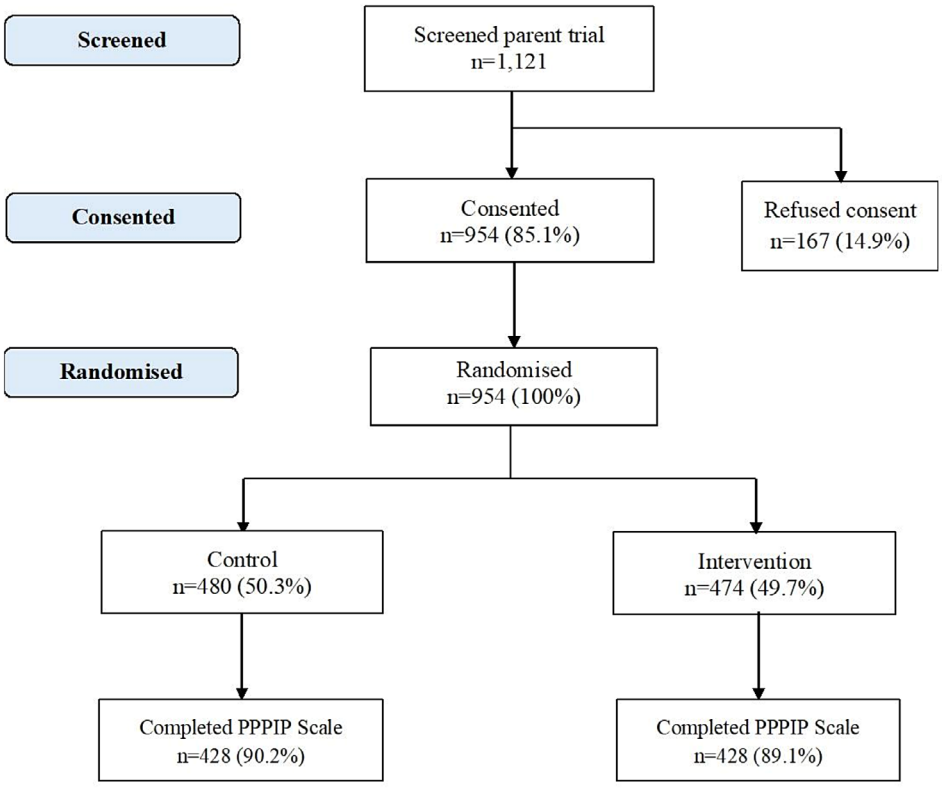

FIGURE 1 | Consort flow diagram patient participation in pressure injury prevention substudy (PPPIP).

TABLE 1 | Characteristics of the sample ($n = 856$).

	Total sample	Control	Intervention	
	$n = 856$	$n = 428$	$n = 428$	
Characteristic	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	***p***
Age (years)	65.7 (11.4)	66.4 (10.8)	65.1 (11.9)	0.099
Number of comorbidities	2.0 (1.2)	2.0 (1.2)	1.9 (1.2)	0.488
Hospital length of stay (days)[a]	6.8 (6.7)	7.0 (7.3)	6.5 (6.)	0.272
Waterlow PI risk assessment (score)	15.9 (4.0)	15.9 (4.0)	15.9 (4.1)	0.939
PPPIP score	22.7 (4.5)	22.8 (4.6)	22.6 (4.4)	0.637
Characteristic	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	***p***
Female	312 (36.4)	157 (36.7)	155 (36.2)	0.887
Admission type				
Surgical	552 (64.5)	277 (64.7)	275 (64.3)	0.886
Medical	304 (35.5)	151 (35.3)	153 (35.7)	
Waterlow PI risk category				
At risk (10–14)	374 (43.7)	195 (45.6)	179 (41.8)	140
High risk (15–19)	317 (37.0)	148 (34.6)	169 (39.5)	
Very high risk (≥ 20)	162 (18.9)	85 (19.9)	77 (18.0)	
Received PIP education	50 (5.8)	22 (5.1)	28 (6.5)	0.382
Use of mobility aids	256 (29.9)	132 (30.8)	124 (29.0)	0.550

Abbreviations: PI, pressure injury; PPPIP, patient participation in pressure injury prevention scale; SD, standard deviation.
[a]Missing data therefore $n = 850$.

TABLE 2 | Construct validity (confirmatory factor analysis) and reliability (Cronbach's alpha) of the patient participation in the pressure injury prevention scale ($N = 856$).

Test	Criteria	Results
Normed χ^2/df	3:1 or less	7.597
Comparative fit index	> 0.90	0.952
Goodness-of-fit index	> 0.90	0.967
Standardised root mean square residual	< 0.10	0.041
Root mean square error of approximation	< 0.07	0.088 (0.073–0.104)
Cronbach's alpha	> 0.70	0.81

Abbreviations: df, degrees of freedom; χ^2, chi-square.

and number of comorbidities) and one with age (use of mobility aids).

Four factors, sex, Waterlow PI risk assessment score, receiving PIP education and using mobility aids, met the cut-off of $p < 0.20$ (Table A1). These variables were then simultaneously entered into a multiple regression analysis (Table 3). The multiple regression model statistically significantly predicted PPPIP scores, $F(4, 855) = 4.769$, $p < 0.001$, adj. $R^2 = 0.017$. Only the use of mobility aids remained statistically significant in the model at $p = 0.03$, with receiving PIP education approaching significance at $p = 0.66$. The standardised beta indicated that using mobility aids was the strongest predictor of patient participation in their PIP care, followed by receiving PIP education.

5 | Discussion

This large observational substudy of medical and surgical patients at risk of PI identified that about two-thirds of participants scored relatively high on the PPPIP scale. Our findings suggest that scores are somewhat higher than reported in a previous study of almost 700 adult patients using the same scale [14]. These high scores, which did not differ between those in the intervention and control group in the parent trial, may reflect the value patients place on active engagement in their PIP care, as has been shown in research related to participation in nursing care in general [23, 24]. In our study, patients self-reported their participation, and while it is always possible this did not reflect their actual behaviours, it demonstrates a potential willingness or desire to be involved in their care.

We found a weak but significant association between the use of mobility aids and participation in PIP. Given limited mobility is a recognised PI risk factor [13, 31], perhaps these individuals are particularly motivated to actively participate in prevention. Authors of a review of 12 studies found individual considerations such as physical ability and daily routines were associated with

TABLE 3 | Independent predictors of patient participation in pressure injury prevention (PPPIP) scores ($n = 856$).

Predictor	B	Std error	β	T	Sig (p)	95% CI lower	95% CI upper	Partial eta^2
Sex	−0.48	0.32	−0.05	−1.53	0.126	−1.11	0.14	−0.05
Waterlow PI risk assessment score	0.03	0.04	0.03	0.83	0.405	−0.05	0.11	0.03
Received PIP education	1.19	0.65	0.06	1.84	0.066	−0.08	2.46	0.06
Using mobility aids	1.06	0.35	0.11	3.01	0.003	0.37	1.75	0.10

Note: $R^2 = 0.022$, Adj $R^2 = 0.017$.

adherence to PIP regimes in the community [32]. In a qualitative study, patients' functional abilities were found to influence their participation in medical and surgical nursing care in general [24]. Patients who rely on mobility aids may have unique needs and challenges that impact their ability to actively participate in prevention measures. But the adjusted R^2 we found was very small, suggesting only a very small proportion of the PPPIP scale score was influenced by using these aids. This suggests other factors should be considered in future work; however, there is limited empirical evidence to guide what these factors might be.

Although not statistically significant at the conventional alpha level of 0.05 'receiving PIP education' approached significance ($p = 0.06$). This is despite less than 10% of patients reported receiving education. Providing patients with information about PIP may have a positive impact on their participation in preventive measures by increasing their awareness of this patient safety issue. But prioritising patient education may not be easy for clinicians, given other clinical demands and workload issues. Other researchers have identified an association between PIP patient education and participation in PIP [18–20] as have authors of a systematic review of eight studies [33]. However, very few participants in our study reported receiving PIP education. A recent comprehensive study of hospital-acquired PIP in one hospital setting found detailed plans for PI education of staff was needed [34]. Thus, suggesting nurses educate patients on PIP is simplistic, as nurses themselves may need education [35] to increase their PIP knowledge before they are able to pass this information on to patients. It is also possible that had we measured participants' knowledge rather than receiving PIP education from clinicians we may have seen different results. Further, as we collected this data in the first 2 days of the trial, it is always possible that they subsequently received this education later in their hospital stay.

6 | Strengths and Limitations

This study has several strengths, including its large, adequately powered sample, providing confidence in the study's results. We also used an instrument that had previously been shown to be valid and reliable. While most fit statistics were met in our study, and were similar to those previously reported for this scale [14], two were not. However, given the chi-square is sensitive to large samples, this was not unexpected. Additionally, room mean square error of approximation values of 0.05 to 0.08 are generally considered acceptable, with values 0.0.08–0.1 marginally acceptable, thus some use the criteria of < 0.10 [29, 36] which was met in our study. Thus, we conclude the PPPIP scale is valid and reliable.

This research also has some limitations. First, because participants were part of a larger clinical trial with strict inclusion and exclusion criteria, the findings may not be generalisable to patients not at PI risk, not incontinent, or not in a PIP study. Second, we did not have data on patients' current health status. We used the number of comorbidities as a proxy for health status, but recognise the two are not the same. Third, we did not measure actual PIP behaviour; patient participation was self-reported. Finally, our model predicted a very small amount of variance in scale scores.

7 | Clinical Relevance

Patient participation in patient safety activities has been a longstanding health system goal [3–5]. Our finding that only the use of mobility aids predicted statistically significant unique variance in PPPIP scores suggests a need to further develop our understanding of the factors that influence patient participation. Authors of a review found that patient knowledge, their health conditions, their beliefs, and experiences were influenced their participation in patient safety activities [37]. But, they also identified not all patients wanted to or were able to participate [37]. This suggests that asking patients about their preferences is also important.

Theory can also inform future work. For example, a recently developed conceptual model of patient participation in nursing care recognises the importance of both patient capabilities and health literacy [1]. This model resonates with an earlier comprehensive framework of patient participation in patient safety activities [38]. It hypothesised patient, healthcare professional, task, work environment and organisation and management influences patient participation. By using frameworks or models and considering factors beyond the patient the field of patient participation in general and in PIP specifically may advance.

Given about a third of our sample reported lower PPPIP scores, strategies to better promote patient participation in PIP may be needed. Initiating targeted discussions about patients' preferences and determining patient knowledge using validated tools such as the Patient Knowledge of and Attitude and Behaviour towards Pressure Ulcer Prevention instrument [39] may help nurses adapt their approaches to promote PPPIP. Ultimately this may lead to patients acting in partnership with nurses. It is also important to recognise that nurses, the work environment, and other organisational factors can influence patient participation. Addressing these broader barriers may further facilitate active patient engagement.

8 | Conclusion

To our knowledge, this is the largest observational study that used the PPPIP scale. We identified about two thirds reported participating in PIP, but only the use of mobility aids explained statistically significant unique variance. Accurate measures of concepts such as patient knowledge, their health conditions and their beliefs and experiences may help to better advance understanding of how to promote active PPPIP. The PPPIP scale is a short, 7-item, easy to administer validated tool that can be used in both practice and research aimed at improving patient participation in their PIP care. Raising patients' awareness of their PI risk and the prevention activities they can implement is an important and simple first step in PI prevention.

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Ethics Statement

This study was approved by the Gold Coast Hospital and Health Services (HREC/2019/QGC/51088) and Griffith University Human Research Ethics Committees (GU Ref No: 2019/685).

Consent

Written informed consent was obtained from all participants at their time of enrolment in the parent trial.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Due to Human Ethics Review Committee approval requirements, data is not available to those not on the research team.

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Appendix A

TABLE A1 | Correlation matrix for predictor variables and the patient participation in pressure injury prevention scale.

Predictor $n = 856$	Total PPPIP score	Randomised group	Sex	Admission type	Use of mobility aids	PIP education received	Age	Number of co-morbidities
Total PPPIP score	—							
Randomised group								
Pearson correlation	0.02	—						
Sig.	0.64							
Sex								
Pearson correlation	−0.06	−0.01	—					
Sig.	0.08	0.89						
Admission type								
Pearson correlation	0.01	0.01	−0.03	—				
Sig.	0.69	0.89	0.39					
Use of mobile aids								
Pearson correlation	0.12**	0.02	−0.05	0.07*	—			
Sig.	**< 0.001**	0.55	0.13	**0.04**				
PIP education received								
Pearson correlation	0.06	0.03	−0.03	0.01	−0.01	—		
Sig.	0.07	0.38	0.40	0.82	0.76			
Age								
Pearson correlation	0.01	0.06	0.06	0.00	0.17**	−0.05	—	
Sig.	0.82	0.10	0.09	0.95	**< 0.001**	0.18		
Total number of comorbidities								
Pearson correlation	0.01	0.02	0.02	−0.08*	0.17**	−0.03	0.22**	—
Sig.	0.76	0.49	0.49	**0.02**	< 0.001	0.33	< 0.001	
Waterlow PI risk assessment score								
Pearson correlation	0.07	0.00	−0.03	0.00	0.33**	−0.01	0.21**	0.33**
Sig.	**0.05**	0.94	0.36	0.91	**< 0.001**	0.73	**< 0.001**	**< 0.001**

Abbreviations: PI, pressure injury; PIP, pressure injury prevention; PPPIP, patient participation in pressure injury prevention.
* 0.01.
** 0.001.
*** 0.0001.