

Nurizzqah Bungsu<sup>1</sup>, Shyh Poh Teo<sup>1, 2</sup> , Noridah Halim<sup>2</sup>, Misli Kula<sup>2</sup>, Asmah Husaini<sup>1</sup>

<sup>1</sup>PAPRSB Institute of Health Sciences, Universiti Brunei Darussalam, Brunei Darussalam

<sup>2</sup>Geriatrics and Palliative Unit, RIPAS Hospital, Bandar Seri Begawan, Brunei Darussalam

# Effectiveness of an online educational intervention for pressure injury prevention in caregivers: a pre-test post-test study

## Abstract

**Background:** Evaluate the effectiveness of an online educational intervention for pressure injury prevention in caregivers of dependent older people during the pandemic.

**Methods:** Quasi-experimental pre-test and post-test intervention design was used. Caregivers of patients deemed as high risk for developing pressure injuries were recruited. WhatsApp messages were the main mode of recruitment and communication. The pretest survey consisted of sociodemographic details and a Brief Pressure Ulcer Knowledge Test. After the pre-test, participants could access the self-developed video that covered information related to pressure injuries and prevention, followed by a post-test survey. Data was entered into Microsoft Excel and analyzed.

**Results:** Out of 83 caregivers, 30 (36.1%) responded to the pre-test survey, while 13 (15.7%) completed the educational intervention and post-test survey. The majority of caregivers were female and aged between 31 to 60 years. The mean pre-test score was 3.73. There were no statistically significant differences between age groups, gender, level of education, length of caregiver experience, and whether they attended previous pressure injury sessions. Among those who answered the post-test survey, the mean score increased from 4.08 to 5.54.

**Conclusions:** The online educational intervention for pressure injury prevention was associated with a low response rate and a likely non-clinically significant difference in knowledge scores among caregivers for dependent older patients.

*Palliat Med Pract*

**Keywords:** COVID-19, education, pressure ulcer, prevention

## Address for correspondence:

Shyh Poh Teo

PAPRSB Institute of Health Sciences, Universiti Brunei Darussalam, Gadong BE1410, Brunei Darussalam

e-mail: shyhpoh.teo@ubd.edu.bn



Palliative Medicine in Practice

Copyright © 2024 Via Medica, ISSN 2545-0425, e-ISSN 2545-1359

DOI: 10.5603/pmp.100938

Received: 30.05.2024 Accepted: 10.06.2024 Early publication date: 14.06.2024

This article is available in open access under Creative Commons Attribution-Non-Commercial-No Derivatives 4.0 International (CC BY-NC-ND 4.0) license, allowing to download articles and share them with others as long as they credit the authors and the publisher, but without permission to change them in any way or use them commercially.

## Introduction

During the COVID-19 pandemic, stringent movement restrictions affected the delivery of health services, including community nursing visits to bedridden patients [1]. In Brunei, there was also an observed increase in dependent patients hospitalized with infected deep-pressure injuries and osteomyelitis, with a 67% inpatient mortality rate [2]. This necessitated the implementation of preventive measures for caregivers of dependent patients to reduce the risk of pressure injuries.

Pressure injuries are caused by constant external forces against the skin, resulting in hypoxia and damage to the skin and underlying structures [3]. Bony prominences are the most commonly affected, including the sacrum and heel. Pressure injuries cause pain, suffering, and impaired quality of life and can be complicated by bacteremia, cellulitis, osteomyelitis, and sepsis [4]. From a public health perspective, pressure injuries are an underappreciated cause of significant economic burden with associated treatment costs [5]. Given the scale of this problem, the European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel, and Pan Pacific Pressure Injury Alliance collaborated to publish an international clinical practice guideline on the prevention and treatment of pressure injuries, which was updated in 2019 [6].

Preventive measures include regular skin assessment, maintaining active mobility, good nutrition, and appropriate materials for mattresses or cushions [3]. Dependent patients with limited mobility, strength, or cognitive abilities rely on caregivers to implement preventive measures, such as regular turning and managing incontinence. Caregiver education on preventive measures has been shown to improve knowledge and compliance and thus should be emphasized to reduce the incidence of pressure injuries [7–9]. This study aimed to evaluate the effectiveness of an online educational intervention for pressure injury prevention in caregivers during the pandemic.

## Methods

A quasi-experimental pre-test and post-test intervention design was used. The target population was caregivers of patients under Geriatrics, Palliative Care, and Home-Based Nursing (HBN) services in the community. Inclusion criteria were caregivers of bedbound or chairbound patients, aged 18 years or older and able to give informed consent, read and write in English or Malay, able to use the WhatsApp application, and be involved with patient care for at least a month.

WhatsApp Messenger is a Mobile Instant Messaging (MIM) platform, that allows smartphone users to connect online to send real-time text messages at minimal cost, is widely used in the Brunei community and has been used in other research studies to send hyperlinks to online surveys and information [10].

All patients identified by the nurses as high risk for developing pressure injuries, whose caregivers may benefit from pressure injury prevention knowledge were recruited. Caregivers were contacted using WhatsApp for recruitment and to share the participant information sheet and consent form. For consenting participants, after completing the pre-test survey to evaluate baseline knowledge, a link to an online educational video on pressure injury prevention was provided, followed by a post-test survey. Non-respondents were given a follow-up reminder through WhatsApp after two weeks.

The pre-test survey consists of two sections: firstly, sociodemographic details (age, gender, education level, caregiving duration, and whether they attended previous educational sessions), and secondly, a Brief Pressure Ulcer Knowledge Test (B-PUKT), consisting of ten true-false questions related to pressure injury staging, risks, and prevention adapted from the Pieper Pressure Ulcer Knowledge Test for caregivers [7]. The Brunei-Malay questionnaire was piloted on ten caregivers to validate the survey, after which no changes were required to the initial questionnaire. The video was an 8-minute self-developed video covering etiology, staging descriptions, risk factors for developing pressure injuries, skin care and assessment, selection, and use of support surfaces, and the importance of nutrition.

Collected data was entered into Microsoft Excel and analyzed using RStudio Desktop version 1.3.1093 (for Windows). This study was conducted from January 2022 to March 2022. The study was approved by the Medical and Health Research and Ethics Committee (MHREC) and the Institute of Health Sciences Research Ethics Committee (IHSREC) of Brunei Darussalam (Reference number UBD/PAPRSBIHSREC/2021/98).

## Results

There were 83 caregivers identified, with 30 respondents for the pre-test survey (36.1% response rate). Only 13 (15.7%) completed the educational intervention and post-test survey. The majority (70%) of caregivers were female, mostly aged between 31 to 60 years old. Approximately four-fifths had at least secondary level education, while one-third were caregiving for less than a year.

**Table 1. Caregivers’ count and percentage of correct answers in Brief Pressure Ulcer Knowledge Test in the pre-test (n = 30) and the post-test (n = 13)**

Question	n [%]					
	Pre-test (n = 30)			Post-test (n = 13)		
	Correct	Incorrect	Don't know	Correct	Incorrect	Don't know
<b>Wound</b>						
Q1: The causes of pressure injuries are external factors	5 (16.7)	9 (30.0)	16 (53.3)	4 (30.8)	7 (53.8)	2(15.4)
Q3: Scapula, sacrum, and heel are common locations of pressure injury development	23 (76.7)	1 (3.3)	6 (20.0)	12 (92.3)	0 (0.0)	1 (7.7)
<b>Staging</b>						
Q5: The grade II pressure injury is full-thickness skin loss. The injury becomes deep enough to see bone	7 (23.3)	16 (53.4)	7 (23.3)	6 (46.2)	6 (46.2)	1 (7.7)
<b>Prevention</b>						
Q2: The use of a donut-shaped cushion can prevent pressure injuries effectively	3 (10.0)	13 (43.3)	14 (46.7)	8 (61.5)	4 (30.8)	1 (7.7)
Q4: Incontinent patients are more susceptible to pressure injury development	13 (43.3)	3 (10.0)	14 (46.7)	7 (53.8)	3 (23.1)	3 (23.1)
Q6: Repositioning is not necessary to be performed on a bed-bound patient when a ripple bed is applied	17 (56.7)	5 (16.6)	8 (26.7)	12 (92.3)	1 (7.7)	0 (0.0)
Q7: The use of proper transfer techniques can reduce shearing forces and friction	29 (96.7)	0 (0.0)	1 (3.3)	12 (92.3)	1 (7.7)	0 (0.0)
Q8 Overweight bed-bound patients have a higher risk of pressure injury development than those who are underweight	4 (13.3)	22 (73.4)	4 (13.3)	0 (0.0)	11 (84.6)	2 (15.4)
Q9: The fully inflated ripple bed has the best pressure-relieving effect	2 (6.7)	26 (86.6)	2 (6.7)	4 (30.8)	9 (69.2)	0 (0.0)
Q10: No additional care is needed for a blister at the heel	9 (30.0)	7 (23.3)	14 (46.7)	8 (61.5)	3 (23.1)	2 (15.4)

The questions in the B-PUKT and participants’ responses in the pre-test and post-test questions are shown in Table 1. Almost all respondents (96.7%) were aware of the importance of transfer techniques in reducing shear forces and friction. The most incorrect or “Don’t know” answers were for the statements “The causes of pressure injuries are external factors” and “The fully inflated ripple bed has the best pressure relieving effect”.

The mean (SD) pre-test score was 3.73 (1.57). The 31–40 years age group had the highest mean (SD) score of 4.33 (2.16). When pre-test scores were compared between age groups, gender, level of education, length of caregiver experience, and whether they attended previous pressure injury sessions, there were no statistically significant differences (Table 2).

Among the 13 caregivers who answered the post-test survey, most (92.3%) scored five points or

higher. After the intervention, the mean (SD) scores increased from 4.08 (1.66) to 5.54 (1.66), which was statistically significant ( $p = 0.0196$ ) using the Wilcoxon signed-rank test. However, comparisons across the different categories (wound, staging, and prevention) found no significant change in scores, except for the prevention category ( $p = 0.0141$ ). It is unclear whether this difference will be clinically significant.

### Discussion

The COVID-19 pandemic enabled the use of virtual or online approaches for social interaction and engagement, which was an opportunity to develop novel health education approaches for the community [11]. When an increasing number of patients developing pressure injuries in the community was observed, a virtual educational intervention was required to

**Table 2. Factors (categorical variables) associated with the pre-test knowledge score**

Variable	Mean (SD)	Statistics (df)	p-value
<b>Age (years)</b>			
18–30	4.00 (1.15)	$X^2 = 1.63 (4)^a$	0.804 <sup>a</sup>
31–40	4.33 (2.16)		
41–50	3.67 (1.32)		
51–60	3.14 (1.95)		
> 60	3.75 (0.957)		
<b>Gender</b>			
Male	3.00 (1.32)	$W = 132^b$	0.08 <sup>b</sup>
Female	4.05 (1.60)		
<b>Level of education</b>			
Primary level (up to year 6)	3.00 (1.00)	$X^2 = 4.31 (2)^a$	0.116 <sup>a</sup>
Secondary level (O-Level graduates)	3.54 (1.66)		
Tertiary level and above (Diploma, degree graduates)	4.50 (1.58)		
<b>Length of experience as a caregiver</b>			
1–6 months	4.20 (1.10)	$X^2 = 3.62 (4)^a$	0.460 <sup>a</sup>
7–12 months	3.00 (1.41)		
1–3 years	3.29 (1.50)		
3–5 years	3.80 (1.30)		
> 5 years	4.57 (1.99)		
<b>Previous experience of attending a session on pressure injury</b>			
Yes	4.50 (1.76)	$W = 51.5^b$	0.279 <sup>b</sup>
No	3.54 (1.50)		

<sup>a</sup>Kruskal–Wallis test; <sup>b</sup>Mann–Whitney test; df — degrees of freedom; SD — standard deviation

mitigate this risk. A study using a web-based course on caregiving essentials for informal caregivers of older people in Ontario, Canada was found to be effective [12], thus an online video intervention was developed for caregivers.

WhatsApp was the messaging application used to share links to questionnaires and educational videos. While a survey of older adult phone users showed that internet use was the least frequent mobile activity [13], participants were caregivers who interacted with the nursing services using the application. Thus, the use of WhatsApp via mobile phone for the intervention during the pandemic appeared feasible. Factors influencing caregiver involvement in pressure injury management include individual motivation, associated feelings, welfare, and moral consciousness [14]. Studies have also shown that patients and caregivers were willing to learn about pressure injury prevention despite a lack of provision

of such practical knowledge from health professionals [14–16]. Hence, the limited engagement from the caregivers was unexpected.

In this study, the caregivers were predominantly female, and over two-thirds of caregivers were aged 40 years and older. This may be due to long-standing cultural expectations placed on women as the primary caregiver for families [17]. The majority of caregivers have not attended previous educational sessions on pressure injuries, usually provided during clinic or home visits. Almost all participants (90%) had poor baseline knowledge and scored below 50% in the pre-test. This was similarly observed in other studies [7, 9]. A study of nurses found that the level of education, length of work experience, and formal training were associated with better knowledge of pressure injury prevention [18]. However, in this study, those who attended previous educational sessions did not have higher scores, suggesting a need to evaluate the

effectiveness of educational sessions, and possibly a need for refresher sessions.

The statistically significant improvement in mean scores after the intervention in terms of absolute increase in scores was marginal and unlikely to have clinically significant outcomes. There was also a low participation rate, possibly due to insufficient engagement in the online educational session. A study investigating the effectiveness of different modes of teaching found that college students who participated in online classes had lower examination scores compared to those attending face-to-face classes [19]. Another study found that participants had difficulties with asthma inhaler techniques taught online, with a need for in-person follow-up sessions [20]. Thus, further effort is needed to ensure the effectiveness of knowledge transfer using an online modality. A suggested way forward is to provide the information online, which is reinforced with a follow-up practical hands-on session on pressure injury prevention approaches. Spaced experiential learning training is more engaging and successful for long-term knowledge retention [21, 22].

The main limitation of this study is the low response rates from participants. Further studies are required to elucidate reasons for low engagement and identify approaches to improve response rates and effectiveness of knowledge transfer to prepare for future pandemic situations.

## Conclusions

The online educational intervention for pressure injury prevention was associated with a low response rate and a likely non-clinically significant difference in knowledge scores among caregivers for dependent older patients.

## Article information and declarations

### Acknowledgments

None.

### Data availability statement

The data that support the findings of this study are available on request from the corresponding author.

### Ethics statement

This study was approved by the joint Medical and Health Research and Ethics Committee (MHREC) and Institute of Health Sciences Research Ethics Committee (IHSREC) of Brunei Darussalam (Ref: UBD/PAPRSBIHSREC/ /2021/98).

### Author contributions

All authors were equally involved in data collection and analysis, drafting, and finalizing the manuscript. The intervention (informative video) was developed by NB and AH.

### Conflict of interest

The authors have no conflicts of interest to declare.

### Funding

No funds were obtained for this study.

### Supplementary material

None.

## References

1. Sofian AIH, Md Jappara JS, Amzizulfadzillah AF, et al. COVID-19 pandemic situation analysis for Brunei Darussalam – perspectives from the front line, geriatric medicine and mental health. *Pac J Med Sci.* 2021; 21(2): 5–11.
2. Ahmad MH, Halim N, Teo SP. Stage 4 sacral pressure injuries among fully dependent older adults during the COVID-19 pandemic. *Aging Med Healthc.* 2021; 12(4): 159–161, doi: [10.33879/amh.124.2021.03014](https://doi.org/10.33879/amh.124.2021.03014).
3. Teo SP, Halim HH. Pressure injury prevention and management — hospital initiatives and interventions. *J Gerontol Geriatr.* 2019; 67: 235–238.
4. Onn LV, Teo SP. Hip osteomyelitis secondary to pressure injury: a case report. *Asian J Gerontol Geriatr.* 2019; 14(1): 30–32, doi: [10.12809/ajgg-2018-300-cr](https://doi.org/10.12809/ajgg-2018-300-cr).
5. Padula WV, Delarmente BA. The national cost of hospital-acquired pressure injuries in the United States. *Int Wound J.* 2019; 16(3): 634–640, doi: [10.1111/iwj.13071](https://doi.org/10.1111/iwj.13071), indexed in Pubmed: [30693644](https://pubmed.ncbi.nlm.nih.gov/30693644/).
6. European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance. *Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline. The International Guideline.* Emily Haesler (Ed.). EPUAP/NPIAP/PPPIA: 2019.
7. Chong KW, Lee SWA. A home-based education programme in pressure injury prevention and management for caregivers of elderly patients: a pilot study. *Asian J Gerontol and Geriatr.* 2017; 12: 53–59.
8. Alhammadi HMA, Ogale RJ. Effectiveness of home caregivers teaching program on prevention of decubitus ulcer in bed ridden elderly patients. *Int J Nurs.* 2020; 7(2): 2373–7670, doi: <https://doi.org/10.15640/ijn.v7n2a8>.
9. Ibrahim D, El-Maksoud M. Training program for caregivers to prevent pressure ulcers among elderly residents at geriatric homes. *Front Nurs.* 2021; 8(3): 249–259, doi: [10.2478/fon-2021-0026](https://doi.org/10.2478/fon-2021-0026).
10. Manji K, Hanefeld J, Vearey Jo, et al. Using WhatsApp messenger for health systems research: a scoping review of available literature. *Health Policy Plan.* 2021; 36(5): 594–605, doi: [10.1093/heapol/czab024](https://doi.org/10.1093/heapol/czab024), indexed in Pubmed: [33860314](https://pubmed.ncbi.nlm.nih.gov/33860314/).
11. Krohn KM, Sundberg MA, Quadri NS, et al. Global health education during the COVID-19 pandemic: challenges, adaptations, and lessons learned. *Am J Trop Med Hyg.* 2021; 105(6): 1463–1467, doi: [10.4269/ajtmh.21-0773](https://doi.org/10.4269/ajtmh.21-0773), indexed in Pubmed: [34634769](https://pubmed.ncbi.nlm.nih.gov/34634769/).

12. Rottenberg S, Williams A. Web-Based delivery of the caregiving essentials course for informal caregivers of older adults in ontario: mixed methods evaluation study. *JMIR Aging*. 2021; 4(2): e25671, doi: [10.2196/25671](https://doi.org/10.2196/25671), indexed in Pubmed: [34128815](https://pubmed.ncbi.nlm.nih.gov/34128815/).
13. Navabi N, Ghaffari F, Jannat-Alipoor Z. Older adults' attitudes and barriers toward the use of mobile phones. *Clin Interv Aging*. 2016; 11: 1371–1378, doi: [10.2147/CIA.S112893](https://doi.org/10.2147/CIA.S112893), indexed in Pubmed: [27757025](https://pubmed.ncbi.nlm.nih.gov/27757025/).
14. García-Sánchez FJ, Martínez-Vizcaino V, Rodríguez-Martín B. Patients' and caregivers' conceptualisations of pressure ulcers and the process of decision-making in the context of home care. *Int J Environ Res Public Health*. 2019; 16(15), doi: [10.3390/ijerph16152719](https://doi.org/10.3390/ijerph16152719), indexed in Pubmed: [31366078](https://pubmed.ncbi.nlm.nih.gov/31366078/).
15. Ilesanmi R, Olayinka B, Hanson V. Patients and caregivers' understanding of pressure injury risk factors and their participation in care. *Intl J Stud Nurs*. 2019; 4(2): 52, doi: [10.20849/ijsn.v4i2.574](https://doi.org/10.20849/ijsn.v4i2.574).
16. Latimer S, Chaboyer W, Gillespie B. Patient participation in pressure injury prevention: giving patient's a voice. *Scand J Caring Sci*. 2014; 28(4): 648–656, doi: [10.1111/scs.12088](https://doi.org/10.1111/scs.12088), indexed in Pubmed: [24117711](https://pubmed.ncbi.nlm.nih.gov/24117711/).
17. Zygouri I, Cowdell F, Ploumis A, et al. Gendered experiences of providing informal care for older people: a systematic review and thematic synthesis. *BMC Health Serv Res*. 2021; 21(1): 730, doi: [10.1186/s12913-021-06736-2](https://doi.org/10.1186/s12913-021-06736-2), indexed in Pubmed: [34301248](https://pubmed.ncbi.nlm.nih.gov/34301248/).
18. Nuru N, Zewdu F, Amsalu S, et al. Knowledge and practice of nurses towards prevention of pressure ulcer and associated factors in Gondar University Hospital, Northwest Ethiopia. *BMC Nurs*. 2015; 14: 34, doi: [10.1186/s12912-015-0076-8](https://doi.org/10.1186/s12912-015-0076-8), indexed in Pubmed: [26034398](https://pubmed.ncbi.nlm.nih.gov/26034398/).
19. Bettinger E, Fox L, Loeb S, et al. Virtual classrooms: how online college courses affect student success. *Am Econ Rev*. 2017; 107(9): 2855–2875, doi: [10.1257/aer.20151193](https://doi.org/10.1257/aer.20151193).
20. Lawn S, Zhi X, Morello A. An integrative review of e-learning in the delivery of self-management support training for health professionals. *BMC Med Educ*. 2017; 17(1): 183, doi: [10.1186/s12909-017-1022-0](https://doi.org/10.1186/s12909-017-1022-0), indexed in Pubmed: [29017521](https://pubmed.ncbi.nlm.nih.gov/29017521/).
21. Kerfoot BP. Adaptive spaced education improves learning efficiency: a randomized controlled trial. *J Urol*. 2010; 183(2): 678–681, doi: [10.1016/j.juro.2009.10.005](https://doi.org/10.1016/j.juro.2009.10.005), indexed in Pubmed: [20022032](https://pubmed.ncbi.nlm.nih.gov/20022032/).
22. Kondratjew H, Kahrens M. Leveraging experiential learning training through spaced learning. *Journal Work Appl Manag*. 2019; 11(1): 30–52, doi: [10.1108/jwam-05-2018-0011](https://doi.org/10.1108/jwam-05-2018-0011).