Special Article

Strategies of Repositioning for Effective Pressure Ulcer Prevention in Immobilized Patients in Home-Based Palliative Care: An Integrative Literature Reviews

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An integrative literature review was conducted to assess available scientific evidence about best strategies of repositioning along with medical devices in the prevention of pressure ulcers in immobilized patients in home-based palliative care. It is important to have evidence-based strategies and principles to prevent pressure ulcers in immobilized patients receiving home-based palliative care. However, there is a lack of consistency in protocol especially in Thailand. This review was done first by searching related literature through electronic databases including Cochrane, PubMed, Web of Science, Scopus, MEDLINE, ProQuest, and CINAHL that were published between 2010 and 2019. The PRISMA guidelines were used to structure the review. The findings of the review indicated that the best method or repositioning was 30° lateral tilt every 2 to 3 hours. However, alternative strategies, such as a combination involving medical devices such as a special mattress or automatic bed that can extent the duration of repositioning from every two hours to three to four. There is a need for further research examining the effectiveness of 3-hourly repositioning with use of a medical device that could reduce risk of pressure ulcers while reducing the burden on family caregiver.

Keywords: Repositioning, Pressure ulcer, Prevention, Immobilized patients, Palliative care

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Pressure ulcer (PU) is an important healthcare problem throughout the world[1,2]. The presence of one or more pressure ulcers can have detrimental physical and psychological effects on both patients and family caregivers[3]. Pressure ulcers are associated with complications such as septicemia, osteomyelitis, morbidity, mortality, patient stress and increased family caregiver burden[4]. In addition, the extensive care associated with pressure ulcers places economic financial burden on the health care system. This is related to higher costs of hospitalizations, increased length of stay associated with complication that may occur. The optimal strategy to deal with pressure ulcers is prevention. Currently, there is a lack of rigorous research addressing the effectiveness of turning and repositioning, and it is unclear how to tailor the frequency and posture to meet specific patient needs. Two-hourly repositioning, through loading distribution, has been the standard of care as evidenced by clinical practice guidelines. This may be most effective when patients are able to assist and if practical for the caregivers. However, when patients are immobilized and have multiple chronic conditions, this may cause care burden especially for the family caregiver.

In Thailand, many patients suffer from chronic illnesses and negative palliative care at home. The focus of palliative care is not only to provide comfort through prevention of pressure ulcers, but also to minimize family caregiver burden. Caregivers may struggle with scheduled two-hourly repositioning which leads to variability in care. It is timely to investigate the best evidence as to which approach (s) can prevent PU and how best to reduce family caregiver burden in pressure ulcer care.

Objective

An integrative review was conducted in relation to repositioning in immobilized patients at home. The goal of this review was to synthesize the literature that contributes to PU prevention and treatment. These finding can serve as the basis for interventions that can be successfully used with person receiving palliative care, as well as for future research in this area. Therefore, it is important to determine the most cost effective intervention that could yield optimal outcomes (i.e. PU prevention) in immobilized patients receiving palliative care, especially for those in Thailand.

Materials and Methods

Sample

A comprehensive literature review was conducted

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using the following online databases: MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), ProQuest, and Web of Science. The keywords were repositioning strategies such as duration, position, frequency, combined with medical device for PU prevention such as the special bed and mattress. The time frame for the publications was between 2010 and 2019, as it was determined that the literatures on the repositioning strategies prior this time were limited. Given the language literacy and the resources available, articles were retrieved in both Thai and English. Publication categories were limited to primary research reports. Using this criterion, a total of 39 articles were retrieved. Although titles and abstracts seemed to indicate that the retrieved articles were relevant to the review, 25 articles were excluded because they focused on the initial development of a device. Finally, 14 articles were used in the present study.

Procedure

Each article was read and critiqued independently by each of the authors, and each study was systematically assessed for the following characteristics: purpose statements or research questions, study design, sample size, subject characteristics, the measurement of independent and dependent variables, interventions, data analysis method, and findings. Major principles and findings were identified for each of the studies. After the in-depth review, the authors discussed the results and developed the final integrated literature review.

Results and Discussion

The results indicate that an essential component of pressure ulcer prevention for immobilized patients is repositioning to relieve mechanical loading at bony prominence areas[5-12] as shown in Table 1. In immobilized patients, the current prevention practice is to reposition at-risk patients every two hours. The 30° tilt, three-hourly repositioning are effective strategies for reducing the incidence of pressure ulcers[5-12]. The 20° to 30° tilting without raising the head-of-bed reduces the interface pressure (ranged from 44 to 95 mmHg depending on body mass index (BMI) and shearing on sacral bony prominence[13,14] which significantly removes the highest point of strain. The peak pressure of the greater trochanter increased the risk of pressure ulcers circumstances. Lippoldt et al reported that the 45° upright position increased interface pressure at sacral bony prominence despite having specific mattress to reduce pressure occurrence[15].

From the Table 1, there were studied associated the repositioning strategies in many settings including intensive care unit, long term care, and home-based care. The systematic review of Gillespie et al[8] presented that two-hourly repositioning to prevent sustained high and prolonged loadings on any particular tissue area is the standard of care[8]. Meanwhile, the National Pressure Ulcer Advisory Panel (NPUAP) conference[10] could not reach a consensus due to lack of epidemiological evidence, that 2-hourly repositioning should be the "guideline for care" when clinically appropriate[16,17]. Some evidence for manual repositioning, used as the primary intervention strategy, failed to reduce the incidence of pressure ulcer formation and showed that more frequent repositioning consequently cannot be considered as an effective method to prevent PU[14].

Identifying the frequency of repositioning through research studies, is an important goal to determine what the standard of care should be and what are the associated costs (direct and indirect). Indeed, repositioning takes up the largest proportion of the time devoted to pressure ulcer prevention; reported in one study the major contributors to cost were caring time for repositioning to prevent pressure ulcers[18].

One study[19] presented that repositioning increased workloads of caregiver to nurse-patient and show that participants were repositioned on average 15 times/day; 0.6 times/hour or every 1.7 hours[19]. Participants were repositioning on average 0.7, 0.6 and 0.5 times/hour on a respective day, evening and night shift[8]. Several studies have shown that the 2 to 3 hourly with 30 tilt position is less costly in terms of nurse time (number of turns/pt., nurse/turn, nurse time/turn)[11,12], but a review of the literature showed no available studies examine the cost with family caregivers. For minimizing caregivers' burden related to high workload, a medical device especially the innovation that can maintain the patient in 30° tilt position because standard pillow turns are not maintained over time as needed[20]. The evidence clearly supports that pressure-redistributing surfaces cannot replace patient repositioning[16]. Healthcare providers should pay attention to the actual tissue-relieving of their turning and repositioning interventions[14].

Overall, there are three major issues related to repositioning strategies in these patients' themes including:

1) The optimal repositioning interval

From the current studies, it is clear that the significant factors contribute to pressure ulcer relief/prevention, include loading distribution and relief mechanical loading at bony prominence areas through the 30° lateral tilt at least every 2 hours[5-13]. Bi-hourly repositioning can significantly reduce the incidence of pressure ulcers, as evidenced by the experimental studies using magnetic resonance imaging/MRI to evaluate the incidence of tissue injury and microcirculation obstruction[13]. The findings showed that two-hourly repositioning is affective by reducing internal strain of participant sacral regions where prolonged ischemia can cause pressure ulcer. Also, Pickham et al[21] studied 1,812 patients from two intensive care units using a single-site, randomized controlled trial design. The present study determined the effect of bi-hourly repositioning on pressure ulcer rates before and after receiving clinical care optimized by the Leaf Patient Monitoring System (Leaf Health Care, Pleasanton, CA, USA). The results showed a statistically significant decrease in PU incidence ($p<0.001$).

2) Repositioning techniques

Adopting the 30° tilt without raising the head of the bed has shown to reduce pressure ulcer incidence

Table 1. Summary of the strategies of repositioning and innovations to prevent pressure ulcer

Authors	Purpose	Samples/settings	Results comment	Remarks
Kapp et al (2019)	To evaluate the maintenance of the 30° side lying lateral tilt position when using the standard care pillow and a purpose designed positioning device.	64 elderly patients/ long term care home	The average lateral tilt position was different for the pillow between the different time points ($p<0.001$).	Positioning when in bed is an essential intervention for pressure injury prevention and optimize the effectiveness of positioning have the potential to improve the care provided to patients, prevent pressure injuries.
Yap et al (2018)	To determine the optimal repositioning intervals on the incidence of pressure ulcer.	321 nursing home residents	No statistically significant difference in the number of pressure ulcers between the two, three or four-hourly repositioning and visco elastic mattress surface using.	Nursing staff on-time repositioning compliance nearly 100% with 4-hourly repositioning.
Pickenbrock et al (2017)	To examine the pressure distribution of healthy individuals either positioned in neutral or conventional positioning.	Four healthy participants	The participants positioned in neutral exerted substantially lower pressure on a measurement mattress compared to the participants positioned in conventional positioning	the use of positioning in neutral should be preferred over the use of conventional positioning due to decreased pressure exerted on the body
Edger (2017)	To determine the hospital-acquired pressure injury rate before and after the introduction of the repositioning device.	717 patients cared for home-based care	A statistically significant pressure injury occurrence reduction before and after the intervention.	Caregivers who use the repositioning device reported significantly less the exertion.
Do et al (2016)	To examine the pressure-relieving effects of a continuous lateral turning device on common pressure ulcer sites.	24 adult participants	The most effective angles for pressure relief were at the pressure ulcer sites were 30° at the occiput, 15° at the left scapula, and 45° at the sacrum.	Continuous lateral turning with our specially designed device effectively relieved the pressure of targeted sites.
Powers (2016)	To evaluate two methods for patient positioning (standard of care using pillows versus a patient positioning system) on the development of pressure ulcers.	59 immobile and mechanically ventilated patients	A statistically significant difference in the incidence of pressure ulcers between turning methods and control group required significantly more repositioning episodes than experimental group	Standard pillow turns are not maintained over time, resulting in patients lying on their backsrather than a position that off-loads pressure

Table 1. Cont.

Authors	Purpose	Samples/settings	Results comment	Remarks
Oomens et al. (2016).	To determine the internal strains in a supine position and during tilting.	14 adult participants	The strain was lowest for 20° and 30° tilt position.	Optimal tilting degree between 20° and 30°, which may vary depending on factors such as body mass index.
Gunningberg & Carli (2016)	To study the effect of the continuous bedside pressure mapping system. on the optimize repositioning.	Registered nurses and nursing assistant worked in pairs, along with two volunteers	Peak pressures in the lateral position were significantly reduced.	The quality of nursing care is different depending on the person performing the repositioning, even when the support surfaces and available equipment are the same.
Yoshikawa et al (2015)	To verify the optimal distributive position in bedridden patients	17 bedridden patients with high risk of pressure ulcers	The 30° and 40° lateral positions had significantly lower interface pressure than other positions.	The interface pressure over the sacrum in the supine position was significantly greater than other area.
Woodhouse et al (2015)	To compare the effects of an automated tilting mattress to standard manual repositioning, using the 30° tilt.	Ten healthy participants	There were also no significant differences in the peak interface pressures between postures (supine, left tilt and right tilt), for both the lateral pressure redistribution and manual tilt protocols.	This was reported more frequently during the LPR protocol reporting 'unsafe' compared to one individual during the manual tilt protocol.
Lippoldt et al (2014)	To measure pressure at the interface between sacral skin and the supporting surface.	20 adult participants	Peak sacral interface pressures increased significantly only at 45° of backrest elevation.	Risk area and peak pressures significantly increased with increasing weight and decreased with age.
Moore, Cowman & Posnett (2013)	To compare pressure ulcer incidence and costs associated with repositioning to what if there are two groups.	213 older hospitalized patients	The 30° tilt, has been shown to be more effective in reducing the incidence of pressure ulcers and is less costly in terms of nurse time.	The mean time per turn was 3.01 minutes in the experimental group and 5.93 min utes in the control group.
Gravenstein, et al (2013)	The effect of routine repositioning on the interface pressures among bedrid-den patients.	23 participants in intensive care patients.	Bed-ridden, at-risk patients, have skin areas that are likely always at risk throughout their hospital stay despite repositioning.	Healthcare providers are unaware of the actual tissue-relieving effectiveness of their reposi-tioning interventions.

compared with standard care of raising the bed greater than 30° tilt (p<0.001). The findings from multiple studies have indicated that this was because the peak pressure of the greater trochanter was significantly decreased with the 30° tilt[5-13,15,22].

A systematic review further supports at least two-hourly repositioning guidelines to prevent sustained high and prolonged loadings on any particular bony prominence as a way to prevent pressure ulcer[8]. However, some studies have shown frequency of manual repositioning may not be the most important aspect of preventing pressure ulcer[6,14]. Studies using manual repositioning as a primary intervention

Table 1. Cont.

Authors	Purpose	Samples/settings	Results comment	Remarks
Moore et al (2011)	To compare pressure ulcer incidence and costs associated with repositioning.	213 older persons in a long-term care	A statistically significant difference in the number of pressure ulcers between experimental group and control group especially the 30° tilt, three-hourly repositioning has been shown to result in better outcomes in terms of pressure ulcer incidence.	Mobility and activity were the highest predictors of pressure ulcer development.
Rich et al (2011)	To examine the association between repositioning andpressure ulcers incidence.	269 bedbound elderly patients	53% of patients were 2-hourly repositioned.	The rate of incident pressure ulcers stage 2 or higher at the visit following an index visit per person-day of follow-up was similar whether or not the patient was positioned frequently.
Peterson et al (2010)	The effects of lateral turning on skin-bed interface pressures in the sacral, trochanteric and buttock regions, and its effectiveness in unloading at-risk tissue.	15 adult participants	Raising the head-of-bed to 30° in the lateral position statistically significantly increased peak interface pressures and total area ≥32 mmHg.	elevated turned positions were statistically greater than their corresponding supine and laterally turned positions.

failed to demonstrate a reduction in the incidence of pressure ulcer development. In fact, findings indicated that more frequent repositioning is not considered the most effective method to prevent pressure ulcer especially in bed-bound patients. In part, this may have been related to family caregivers' inability to meet the demands of frequent manual repositioning. The addition of a medical device that helps with repositioning may be an effective method to address this problem.

3) Using repositioning techniques together with anti-loading devices

Research has shown that medical devices such as a special bed and mattress can reduce pressure ulcer development when combined with evidence-based guidelines that include repositioning. A RCT with a sample of 717 patients in an intensive care unit examined pressure ulcer formation rate before and after use of a repositioning device[22-24]. The repositioning device consisted of an anchor strap, a 30-degree anchor, a low-friction glide sheet and a full-length body pad designed for microcirculation management. Once a patient was placed on the repositioning device, two staff members repositioned the patient every 2 hours. The result showed a statistically significant reduction of pressure ulcer occurrence (p<0.005). Moreover, the caregivers who use the repositioning device reported less exertion (p<0.001). These findings may translate to family caregivers who assume the responsibility for reposition as pressure ulcer prevention, but there are no available studies examining this in family caregivers, especially in Thailand. Moreover, caregivers who use the repositioning device reported significantly less exertion (p<0.001)[20]. The study of Do et al[5], found that the effectiveness of the continuous lateral turning device was motivated by the need for an adequate pressure-relieving device for immobile elderly people.

From the findings, many evidences revealed that repositioning of individuals at risk of pressure ulcers is an essential preventive concept. Research reflects this trend, along with a body of investigations that studied the importance of strategies and principles to prevent this problem. These investigations have been conducted by researchers in various settings and many countries. The studies suggest that "at least two-hourly repositioning with the 30° lateral tilt

position" along with the use of anti-loading devices to facilitate patient repositioning is a concept that can reduce pressure ulcer incidence. Furthermore, innovations such as special beds, mattresses, sheets and overlays designed to redistribute pressure have been widely used to prevent PUs for a long time but have not been used of in Thailand.

Conclusion

Patients with optimal repositioning could lead to more effective pressure area care. Repositioning strategies and innovative functions all contributed positively to pressure ulcer prevention. Research indicated that health professionals and family caregivers both play important roles in preventing pressure ulcers, using specific interventions, especially effective repositioning that contributes to positive patient related outcomes. Especially, is it important to investigate further the knowledge of the multidisciplinary team and the patients regarding their use of the repositioning-based pressure ulcer prevention method, as well as the strengths and weaknesses of the repositioning strategies in home-based palliative care.

What is already known on this topic?

1) Pressure ulcers represent a major burden of sickness and reduced quality of life for people with pressure ulcers and their caregivers.

2) The effective method of pressure ulcer prevention is repositioning.

3) There is a lack of rigorous research addressing the effectiveness of a turning and repositioning.

4) There are unclear guidelines on how to tailor frequency and posture to meet specific patient needs.

What this study adds?

1) The two-three hourly repositionings to prevent sustained high and prolonged loadings on any particular tis-sue area is the standard of care.

2) To minimize caregivers' burden related to high workload, a medical device may be used to maintain the patient in 30° tilt position.

3) Medical devices such as the special bed and mattress can reduce pressure ulcer development when combined with evidence-based guidelines that include repositioning.

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Potential conflicts of interest

The authors declare no conflicts of interest.

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กลยุทธ์การพลิกตะแคงตัวผู้ป่วยที่มีประสิทธิผลในการป้องกันการเกิดแผลกดทับในผู้ป่วยที่ได้รับการดูแลแบบประคับประคองที่บ้าน: การทบทวนวรรณกรรมแบบบูรณาการ

จิณพิชญ์ชา มะมม, มรรยาท รุจิวิชชญ์, Debra Hain

การทบทวนวรรณกรรมแบบบูรณาการครั้งนี้มีวัตถุประสงค์เพื่อทบทวนวรรณกรรมและงานวิจัยที่เกี่ยวกับกลยุทธ์ที่เหมาะสมที่สุดในการพลิกตะแคงตัวเพื่อป้องกันการเกิดแผลกดทับ รวมทั้งการใช้อุปกรณ์เสริมร่วมต่าง ๆ ในผู้ป่วยที่ไม่สามารถช่วยเหลือตนเองได้และได้รับการรักษาแบบประคับประคองที่บ้าน ใช้วิธีการสืบค้นงานวิจัยและวรรณกรรมที่เกี่ยวข้องจากฐานข้อมูลอิเล็กทรอนิกส์ ได้แก่ Cochrane, PubMed, Web of Science, Scopus, MEDLINE, ProQuest และ CINAHL ที่เผยแพร่ระหว่างปีพ.ศ. 2553 ถึง 2562 โดยประยุกต์แนวทางของพริสมา ผลการศึกษาแสดงให้เห็นว่าวิธีการพลิกตะแคงตัวที่ดีที่สุด คือ การพลิกตะแคงตัว 30 องศา ทุก 2 ถึง 3 ชั่วโมง อย่างไรก็ตามมีการศึกษาในเรื่องการเลือกใช้อุปกรณ์การแพทย์ เช่น ที่นอนพิเศษ ที่นอนลม หรือเตียงพิเศษมาช่วยในการพลิกตะแคงตัวให้ห่างขึ้นเป็นทุก 4 ถึง 6 ชั่วโมง เพื่อลดภาระงานและเพื่ออำนวยความสะดวกแก่ผู้ป่วยและญาติผู้ดูแลมากขึ้น แต่อย่างไรก็ตามในระบบการให้การพยาบาลในสังคมไทย ยังให้ความสำคัญกับการพลิกตะแคงตัวทุกสองชั่วโมง ซึ่งเป็นภาระงานที่มากสำหรับญาติผู้ดูแล จึงมีความจำเป็นอย่างยิ่งสำหรับประเทศไทยในการที่จะศึกษาและประดิษฐ์คิดค้นนวัตกรรมที่ช่วยลดภาระงาน ในการพลิกตะแคงตัวผู้ป่วยต่อไป