

USE OF PHYSICAL RESTRAINTS IN INTENSIVE CARE UNIT: A SYSTEMATIC REVIEW STUDY

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ABSTRACT

Background and purpose: Use of physical restraints is a common clinical practice in different conditions and hospital wards including Intensive Care Units (ICU). Given the importance of the use of physical restraints in the ICUs, the present systematic review was conducted in order to determine the prevalence of physical restraint use in the ICUs.

Materials and methods: Related papers on restraint use in the ICUs published from 2000 to 2016 were included in this study by searching the national and international scientific databases. Based on Farsi and English keywords searching, and applying inclusion and exclusion criteria, final 22 papers from 17 countries were selected for the meta-analysis. The data were analyzed by using Stata Software Version 12.0. The index of heterogeneity among different studies was determined using Cochran (Q) and I² tests.

Results: The present systematic review study includes 22 related articles. The prevalence of physical restraints use varied from 7% in the study by Elliott with a sample size of 569 patients in general ICUs in Australia to 87% in Curry's study with a sample of 26 patients in a surgical ICU in the United States. According to the results of the meta-analysis, the prevalence of physical restraints use was estimated to be 46.7% (CI 95%: 34.7-58.6) in the ICUs.

Conclusion: As there is a widespread use of physical restraints in the ICU, it is necessary that hospital managers plan appropriately to reduce the use of physical restraints and whereby its complications and to increase adequately the knowledge, attitudes of ICU nurses towards physical restraint of patients and its affecting factors so that they adhere to the guidelines of this method of care properly.

Keywords: Systematic review, intensive care units, physical restraint.

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Introduction

Critical care is one of the specialized sections of nursing care which its high quality provision to the critically ill hospitalized patients needs project-funding. Moreover, management and treatment process is important for the provision of perfect patient care⁽¹⁾. In the critical care units such as

ICUs, the patients are cared for their life-threatening conditions such as severe lung disease, stroke, serious burns, poisoning and major surgeries such as organ transplantations as well as liver, kidney, heart, bone marrow, brain and nerve surgeries⁽²⁾. Due to the complicated and critical condition of patients in these wards, nursing care is of utmost importance. One of the nursing care services in ICU

is the appropriate use of physical restraints for prevention of harm to the patient^(3,4).

Restraints are defined as any type of instrument, equipment or materials applied on the body or near the body as though the patient had no control over it or is not able to remove or keep it at a distance^(4,7). Restraints could be divided into two categories: physical and chemical⁽⁸⁾. Physical restraints include girdles, gloves, vests, shields, bedside fences etc.^(4,9). Chemical restraints as a usual form of treatment for patients with mechanical ventilation is used to control anxiety, pain and facilitate medical interventions (tracheal tube tolerance)⁽¹⁰⁾. Use of physical restraints is a common clinical practice in different conditions and wards, including ICU⁽⁹⁾. Using physical restraints in ICU to control restlessness, ensure safety and prevent patient falling is common to prevent disease intervention in the treatment and care measures. However, there are abundant physical and psychological negative consequences of the use of these instruments⁽⁴⁾. The use of physical restraints varies from zero to 100% in different countries⁽⁵⁾.

A study reported the use of physical restraints ranging from 3% to 24 % in the ICUs and 3.4% in the other wards. There is a variety of statistics on the use of physical restraints in the ICUs which suggests a wide range of clinical practices among nurses. Therefore, an abundant number of registered policies and guidelines were used to reduce high diversity of physical restraints in patients especially in patients admitted to ICU⁽⁵⁾.

Disadvantages of using physical restraints include independence deprivation of individual patient, harmful physical and mental effects, great physical and emotional reaction, confusion and irritability, increased blood pressure, heart rate and temperature, impaired blood circulation, nerve damage and skin, aspiration, complications associated with immobility such as pressure sores, increased bladder retention and hospital infections, reduced orthostatic hypotension, limbs and joints deformity, decreased blood flow, increased risk of thrombosis and negative nitrogen balance due to muscular dystrophy which all increase the risk of mortality^(2,4,9,13,14,15).

Decreasing use of physical restraints in the ICU is an important indicator of nursing care quality⁽⁷⁾. The role of nursing education is fundamental to prepare qualified nurses to identify patients' needs in the ever-changing environment of the ICUs, including the need for proper use of physical

restraints and provide most appropriate health care services in the light of the best scientific evidences⁽¹⁶⁾.

Given the importance of the use of physical restraints in the ICUs and according to the literature of the scientific databases and precise statistics, the prevalence of the use of physical restraints in the ICU is not available. The present study was planned and conducted to determine the prevalence rate of restraint use in the ICU so that it would be possible to reduce the level of restraints usage for the patients in these special units by using the obtained findings. Hopefully the results of this paper may lead to improve critically ill patients' quality of care in ICUs.

Materials and methods

Search Strategy

The present paper used published articles in Farsi and English that were indexed in Iranian databases including Scientific Information Database (SID), Magiran, Medlib as well as international databases of PubMed, Science Direct, Scopus and Google scholar. Electronically published studies from 2000 to 2016 were selected. The literature search strategy was conducted using Farsi and English keywords with possible combinations of these keycritical words. The keywords included "ICU Nurse, Physical Restraint and Nurse Education" as well as their Farsi equivalent words. Searching the last resources of articles was implemented to find the articles containing the above criteria, which were missed in our study. For further precautions, articles search in the databases was conducted independently by the first and third authors and the extracted cases were compared.

Study Selection

The full text and summaries of all articles, documentations and reports available from the search were extracted. After removing duplicates, unrelated cases were removed orderly after checking the title, abstract and full-text of the articles so that the selected studies were determined. To prevent bias due to reprinting, findings were reexamined to identify and remove duplicates. Moreover, two authors independently implemented the process of study selection. In case of contradictions, the third author made final decisions to exclude or include the articles.

Inclusion Criteria

In the primary studies, data were extracted based on title, first author, publication year, sample size, country of study, type of study and the use of physical restraints in the ICU. The entire studies in Persian and English, which reported use of physical restraint in the ICU, were selected.

Exclusion Criteria

Studies in which the use of physical restraint in the ICU was not reported as well as review papers of the congresses and conferences without full text and case studies were excluded. Besides, the non-English articles, articles without available full text and articles on the healthy people or non-admission in ICU.

Data Extraction

In each of the studies, data were extracted into Excel based on the first author's name, type of study, study location, year of publication, volume, the prevalence and use of physical restraints in the ICU.

Analysis

Stata software ver. 11 (Stata Corporation, College Station, TX, USA) was used for data analysis. At first, the standard error of the prevalence of physical restraint use in each study was calculated based on the binomial distribution formula. The index of heterogeneity between studies was eventually determined using Cochran (Q) and I2 tests. Based on heterogeneity results, random or fixed effects models were applied to estimate the prevalence of physical restraints. The prevalence point of physical restraints with 95% confidence interval was calculated in Forest plot diagram in which square size representing the weight of each study and the lines on both sides shows 95% confidence interval. Factors suspected of heterogeneity were also examined using meta- regression method.

Results

The initial search in the Iranian and international databases recognized 285 documents. Furthermore, the use of “and” operator along with the limited search strategy and higher number of specifications as well as the number of unrelated articles were removed. Finally, 27 articles were included in the systematic review. Of these, five studies did not report the rate of physical restraints

in terms of percentage and presented them as ranges. Therefore, 22 articles were included in the meta-analysis study (figure 1).

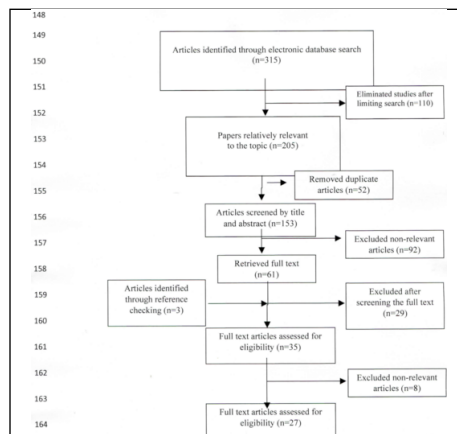


Figure 1: Literature search and review flowchart for selection of primary studies.

The prevalence of physical restraint use amongst 9358 patients admitted to ICU was examined. The prevalence of physical restraints use varied from 7% in the study by Elliott⁽³⁷⁾ with a sample size of 569 patients in General ICU in Australia to the study by Curry⁽³⁴⁾ with a sample of 26 patients in a surgical ICU in the United States. A summary of the data from these studies is presented in Table 1.

id	First author	Publication year	Place of study	Type of study	Sample size	Physical Restraint (%)	AGE	UNIT
1	Kruger (22)	2013	German	multi-centre cross-sectional study	1276	11.8	65	ICU
2	Moradmajid (23)	2015	Iran	cross-sectional descriptive study	120	47.6	50-60	ICUs
3	Minick (20)	2007	United States	descriptive	99	56	-	ICU
4	EUNHA CHOI (24)	2003	Korean	descriptive study	51	46.4	53.7	ICU
5	Julie Barboulet (35)	2010	Europe	prospective	669	39	-	ICUs
6	Yang Ming (25)	2006	Taiwan	descriptive	642	45.2	62.9	medical and surgical ICUs
7	Elena Luk (5)	2014	Canada	prospective observational study	711	53	60.6- 61.1	ICUs
8	Langley(44)	2011	South African	mixed method study	219	48.4	-	ICUs
9	Tanios (26)	2010	United States	large, multi-disciplinary study	1976	72	-	ICU
10	Beth Martin (11)	2005	United States	BICULTURAL STUDY	100	39	55	ICU
11	Egerod (27)	2013	Norway-Europe	cross-sectional	439	14.36	-	ICUs
12	Bury (28)	2014	Canada	prospective, multicenter, observational study	712	53	-	ICUs
13	Rose (29)	2016	Canada	post hoc secondary	430	76	-	ICU
14	Mehra (31)	2015	North America	Randomized trial	420	78	-	medical and surgical ICUs
15	Chang (32)	2008	Taiwan	A case-control study	300	55-82	65.7-65.2	ICU
16	Liu (33)	2009	Taiwan	descriptive correlational study	80	59	-	ICUs
17	Curry (34)	2008	United States	retrospective exploratory	26	87	-	Surgical ICU
18	Happ (35)	2004	United States	retrospective, descriptive study	50	50	62.3	ICU
19	Micek (36)	2005	United States	A prospective, single-center, observational cohort study.	93	50-77	-	CAM-ICU
20	Elliott (37)	2013	Australia/New Zealand	cross-sectional	569	7	62	ICUs
21	Ismael (39)	2014	Egypt	cross-sectional	67	50-78	52	ICU
22	Kandeel (38)	2013	Egypt	descriptive cross-sectional	275	6-46	45.55	ICUs
23	De Jonghe (18)	2013	France	cross-sectional	121	50	-	ICUs
24	Lucidarme (40)	2010	France	prospective, observational	144	13-48	54-69	ICUs
25	Iglesias (41)	2012	Spain	descriptive, prospective study	85	15.6	64.19	ICUs
26	Ozdemir (42)	2009	Turkey	Pre-test and Post-test	40	43	-	ICU
27	Rompaey (43)	2009	Belgium	prospective cohort study	523	38	64	ICU

Table 1: Features of preliminary studies included in meta-analysis of prevalence of physical restraints use in ICUs.

Heterogeneity test results (I-squared: 99.5, $Q=4028.9$, $P<0.001$) showed that there is a disparity in Between the results of initial studies. Accordingly, the random effects model was used to combine the results of preliminary studies and overall assessment. Based on the results of the meta-analysis, the prevalence of physical restraint use in ICU was estimated equal to 46.7% (CI 95%: 34.7-58.6). The type of public or surgical ICU was examined as variable suspected of heterogeneity using meta-regression. The results of this test ($\beta=26.5$, $P=0.045$) showed the significant effect of unit type on heterogeneity amongst the results of initial studies as a border. The results of the meta-analysis were presented in sub- group of the first section. The prevalence of physical restraint use was estimated to be 43.04% (CI 95%: 30.27-55.81 percent) in general ICU and 69.7% (CI 95%: 43.4-95.9) in surgical ICU (Figure 2).

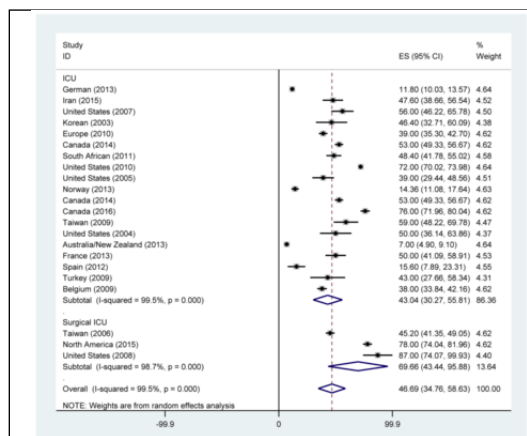


Figure 2: Prevalence of physical restraints use amongst patients in ICU for each one of the primary studies, general estimation and sub-group in general and surgical wards.

Discussion

The results of this Meta analysis showed that using physical restraint is prevalent in 46.7% of the hospitalized patients in the ICUs. Moreover, using this kind of restraint has been determined respectively in 70% and 43% in the hospitalized patients of surgical and general ICUs.

Today, the use of physical restraint is a common practice in ICU to prevent the risk of disrupted treatment by patient and maintenance of patient safety⁽⁶⁾. Although the main purpose of physical restraint use is to maintain patient safety, studies show that it may lead to psychological damages, increased costs and more serious injuries⁽¹⁷⁾. International studies in different countries show that

the use of physical restraint in different countries varies between 0 to 100%^(11, 15, 18). The prevalence of physical restraint use in special care units is 24-40%, which is more than that of the other wards⁽¹⁷⁾. The studies revealed that hospital policies and working conditions such as staff shortage affect the attitude and behavior of personnel in the use of physical restraint, however, implementation of personnel training programs could inform the staffs about the application and side effects of using these instruments for patients, other strategies and alternatives to control aggressive behavior and patients relaxation prior to physical restraint use^(6, 7, 19).

Minnick conducted a study to examine the prevalence of physical restraints use. The results of this study show that physical restraint use in ICU wards was 56 percent. The researchers also reported that the use of sedatives and anesthetic affects the use of restraints in ICUs⁽²⁰⁾. The study by Martin and colleagues indicated that physical restraint use was 39%. In this study, there was statistically significant difference between the use of physical restraint and patients' activity. It also reported that the most common use of physical restraint is to avoid patient falling and instrument usage for invasive treatment in ICU wards⁽¹¹⁾. However, the study by Evans indicated that the use of physical restraint is not secure since 60% of patients had taken out the tracheal tube themselves⁽²¹⁾.

In Germany, Kruger performed a study to evaluate the use of physical restraints. The results of this study showed that physical restraint use was applied in standard form in the acute wards of hospitals in Germany. The use of physical restraint in this study was 11.8%⁽²²⁾. The study conducted by Moradi et al., entitled "use of physical restraints in ICU", reported a prevalence of physical restraint use as 60.47%⁽²³⁾. The study conducted in Korea by Choi et al. showed that the use of physical restraint in the ICU was 4.46%. In this study, the most common cause of hospitalization was respiratory disease (43%) and average length of hospitalization period in the ICU was 13.2 days. The study also showed that the main cause of use or non-use of restraints was patients' restless. Provision of an instrument for patients for accurate assessment reduces the patients' restlessness when using restrains in ICU wards⁽²⁴⁾.

The study by Benbenbishty et al. was implemented to examine the rate of physical restraints use in several European countries. The use of physical restraint in ICU was 39%⁽¹⁵⁾.

The study by Yung Ming et al. indicated that the use of physical restraints in ICU was 45.2%⁽²⁵⁾.

A study was done by Elena Luck in 51 ICUs. In this study the prevalence of use of physical restraint in ICUs was 53% in 711 hospitalized patients⁽⁶⁾. The study by Tanios showed that the use of physical restraint level in ICU was 72%⁽²⁶⁾. A study by Egerod examined the use of physical restraint in Norway and several European countries and the result showed that its prevalence was 14 and 36% in Norway and European countries respectively⁽²⁷⁾. Also, Burry et al. study in Canada found that the use of physical restraint in ICUs was 54%⁽²⁸⁾.

Another study was conducted by Rose et al. in Canada. In this study, the use of physical restraint in special care units was higher compared to that in other countries (74%). The findings of this study showed that physical restraint use is common amongst patients under mechanical ventilation because of the use of sedation protocols. The results showed that except for patients with alcohol use, characteristics of the disease and treatment method could not be a predictor of the use of the restraints⁽²⁹⁾.

A number of other studies also showed that physical constraints cause agitation and so there are possibility of adverse complications such as injury and even death^(11, 30). In the study conducted in 16 countries in North America, physical restraint usage was 78%. The result of this study showed that in patients receiving mechanical ventilation in ICUs, delirium was common and is strongly associated with both duration of hospitalization and the use of mechanical ventilation⁽³¹⁾.

The study implemented in Taiwan examined the physical restrictive effect on unplanned extubation in ICU wards. In this study, there was impaired level of consciousness in patients in ICU and severe infection risk of unplanned extubation even when physical restraint was used. The use of physical restraint in this study varied between 55 to 82%. Chang recommended that nurses must be familiar with the standards of physical restraint use to minimize the risk of unplanned extubation⁽³²⁾. Liu reported that the use of physical restraint in the surgical ICU in Taiwan was 59%. The results of this study showed that the average basic needs supply and communication problems should be improved in intubated patients in the surgical ICU. In fact, basic need supply is associated with predicted communication difficulties, physical barriers, and education-

al level. Surgical intensive care nurses requires training about improving communication skills and restricted use of physical restraints especially in patients with less awareness⁽³³⁾. The study by Curry in the United States examined the factors associated with unplanned tracheal tube in ICUs. This study reported higher level of physical restraints use in surgical ICU compared to other countries (87%). The researcher noted that sedation level, unplanned tracheal tube extubation and re-intubation are associated with each other⁽³⁴⁾. Another study by Happ et al. indicated that restraints use level was 50%⁽³⁵⁾.

According to a study conducted in the United States on delirium and physical restraint use in patients under mechanical ventilation in the ICUs. The results showed that delirium diagnosis was associated with use of physical restraints in ICU and the constraints usage varied between 50 and 77%⁽³⁶⁾.

A study by Kandeel in Egypt examined the use of physical restraints in ICU. The results of this study showed that assessment of physical restraints is mainly restricted to the patients connecting to the environmental blood circulation system. The most common reported side effects of physical restraint use include redness, bruising, swelling and edema of the limbs. The results indicated that there is a lack of awareness on the use of physical restraint and failure to educate patients and their families about the correct way to use this instrument. In this study, the use of physical restraint in the ICU varied between 6-46%. The researcher also emphasized the importance of standard instruction and approaches for appropriate application of physical restraints in the ICU in Egypt⁽³⁸⁾. Another study implemented in Egypt by Ismaeil et al., also indicated that the use of physical restraint in the ICU was 50-78%⁽³⁹⁾.

De Jonghe examined the use of physical restraints in ICUs in France. Its results indicated that the use of physical restraint in mechanically ventilated patients in a country with a relatively high ratio of patients to nurses was implemented with wide variations according to the patients' condition. Besides, the absence of primary common medical instructions or removal of physical restraints show that these decisions are made mainly by nurses. The use of physical restraints in ICUs in this study was 50%⁽¹⁸⁾. According to another study conducted in France by Lucidarme, the use of physical restraints in the ICU was 13-48%⁽⁴⁰⁾.

Another study was done by Iglesias in Spain to examine the use of physical restraints in ICU. The most common cause of using restraints is the threat of disruptions in the course of therapy. The results showed that the use of limiters was 15.6% (41). Ozdemir et al. also reported in their study that the use of restrains is 43%⁽⁴²⁾. Van Rompaey in Belgium showed that the use of limiters was 38%⁽⁴³⁾.

According to Langley study in South Africa in the use of physical restraint in the ICU was studied. A total of 219 patients admitted to the ICU of the three, for 48.4% (106) of the patients had used physical restraint⁽⁴⁴⁾.

The study limitation is the heterogeneity among the results of the primary studies that likely is influenced by sampling size and method of the studies, the type of the ICUs and variation in the hospital physical restraints policies in different countries. It is necessary to mention that, given the above stated limitation, the model of random effect was applied for the calculation. Additionally, the variable of type of ICU as one of the presumed factors of the heterogeneity was analyzed by Meta-regression and the result showed its borderline effect on the heterogeneity.

Conclusion

This meta-synthesis showed that using physical restraints is prevalent in the hospital ICUs considerably and this phenomenon is much more frequent in the surgical ICUs than that in the general ICUs. This study could provide a valid estimation of physical restraints prevalence in the hospital ICUs. This evidence can make an opportunity for policy makers in the health sector to take appropriate measures in order to benefit from physical restraints correctly.

Patient safety is one of the most important responsibilities of nurses. It seems that the use of restraints in hospitals and treatment centers is a simple solution to achieve this common purpose. In fact, using these instruments has many physical, mental and legal aspects. Lack of adequate knowledge and absence of negative attitudes on the use of physical restraints has led to the poor performance of nurses and their restricted ability to care ICU patients appropriately.

Therefore, training nurses to have practical instructions on effective use of these instruments and minimizing its side effects, educating alterna-

tive methods, and recommendations to reduce the use of physical restraints as the latest possible solution to control restless patients and finally moving towards creating an environment free from physical restraints seems to be essential. It is essential that proper planning is conducted for reducing the use of physical restraints and its complications through increasing the knowledge and attitude of nurses in the area of physical restraint of patients and related affective factors.

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