Effectiveness of e-learning on Acute Care Nurses' Knowledge, Skills, Satisfaction, and Self-efficacy: A Systematic Review and Meta-analysis

研究報告

Effectiveness of e-learning on Acute Care Nurses' Knowledge, Skills, Satisfaction, and Self-efficacy
——A Systematic Review and Meta-analysis——

Minami Yasuda, Miyuki Suzuki

英文抄録

Objective：It is difficult for novice nurses to utilize the learning contents from their basic education in their hospital or clinic practice. This discrepancy is particularly noticeable in care of patients' acute phase, in which patients' conditions are serious and their status changes greatly. Clearly, acute care nurses need in-depth knowledge and skills to deal with the increasingly complex status of patients. E-learning has many advantages；it can be used anytime and anywhere and is as effective as conventional face-to-face classes. E-learning is often used in continuing education for nurses. However, systematic reviews describing the impact of this method specifically targeting only acute care nurses have not been published to date. Therefore this systematic review assessed the effect of e-learning on the knowledge, skill performance, satisfaction and self-efficacy of acute care nurses and compared the efficacy of e-learning and traditional learning according to previous studies.

Method：A systematic review and a meta-analysis of randomized controlled trials were performed. A systematic search of MEDLINE, EMBASE, PubMed, CINAHL, PsycINFO, ERIC, and CENTRAL identified relevant peer-reviewed articles. English literature published by November 2019 was targeted. Quality and risk of bias were assessed for every study included using the Cochrane Collaboration Handbook for Syatematic Review of Interventions. A random-effect meta-analysis was performed to generate a pooled mean difference in the e-learning outcome. We assessed the quality of the evidence using the GRADE approach.

Results：We identified four randomized controlled trials（$N=273$ nurses）. We observed no statistical difference between groups for acute care nurses' knowledge, satisfaction, and self-efficacy. The e-learning group had a significantly higher score of skill performance than the traditional learning group. However, studies were largely heterogeneous and generated very low-certainty evidence. This might be due to small sample size, high risk of bias, and lack of blinding in the studies included.

Conclusions：Further investigation with larger sample sizes and more studies following the CONSORT statements are needed to evaluate the effects of e-learning. It can be difficult to improve both knowledge and skills with e-learning alone. Accordingly, we think that combining e-learning and face-to-face lessons may be more effective.

Key words：e-learning, acute care, nurses, systematic review, meta-analysis

Ⅰ. Background

It is difficult for novice nurses to apply the learning contents from their basic education to their hospital or clinic practice（Forsman et al., 2010）. This discrepancy is particularly noticeable in the care of patients' acute phase, in which patients' conditions are serious and their status can change dramatically. Therefore, acute care nurses need in-depth knowledge and skills to deal

受付日：2020年８月５日　受理日：2021年１月28日
St. Luke's International University, Graduate School of Nursing Science, Doctoral Program in Nursing Science

with the increasingly complex status of patients. Recently, e-learning has been attracting attention as one of the effective educational methods. This method has many advantages ; it can be used anytime and anywhere and is as effective as conventional face-to-face classes (Horiuchi et al., 2009 ; Tominaga et al., 2014). E-learning is often used in continuing education for medical staff including nurses and for students' basic education (Bredesen et al., 2016 ; Morente et al, 2013).

We wondered if the knowledge and skills of acute care nurses would improve through e-learning. Several systematic reviews (SR) about e-learning for nurses and nursing students (Lahti et al., 2014 ; Voutilainen et al., 2017) found the indicators used for outcomes were diverse. Additionally, SRs describing the impact of this method specifically on only acute care nurses had not been published to date. Therefore, it was necessary to measure the impact of e-learning interventions on acute care nurses and utilize this knowledge in future e-learning continuing education programs.

Ⅱ. Objective

This systematic review aims to assess the effect of e-learning continuing education on the knowledge, skill performance, satisfaction, and self-efficacy of acute care nurses.

Ⅲ. Method

1. Data sources and searches

We electronically searched MEDLINE, EMBASE, PubMed, CINAHL, PsycINFO, Eric, and CENTRAL for publications in English in November 2019. The search was updated in February 2020. No restrictions were placed on the date of publications and each database was searched as far back as possible. As each database has its unique indexing terms, we developed individual search strategies for each database. We considered the diverse terminology used for e-learning, as this would influence the identification of relevant trials. The search strategy used in English was as follows : (computer-assisted instruction OR computer-assisted OR online OR internet OR computer-based OR e-learning) AND (random allocation OR random* OR randomized controlled trial) AND nurses AND (education, nursing, continuing OR learning) limit to English.

2. Inclusion criteria

We used predefined criteria to include studies in our review. We included studies with a study population of acute care nurses. The intervention used was e-learning. It was defined as the use of computer-assisted learning, CD-ROMs, and online-learning as these represent nuanced variations of e-learning. The control groups received traditional education, which included contact teaching, classroom lecturing, and text-based learning. The primary outcomes listed were the increase in knowledge and skill performance. The secondary outcomes listed were the increase in satisfaction and self-efficacy. Finally, the studies had to be randomized controlled trials (RCT : individual randomization, cluster randomization) to be included. We excluded studies using simulation, mobile phones, and mannequins, as well as studies not published in English.

3. Data extraction

A reviewer (YM) independently extracted data related to the following issues : purpose of the trial, sample, details of the intervention, outcomes, and measurements used, study design, and population. One reviewer (YM) then independently assessed each citation against the inclusion/exclusion criteria. The full text of studies eligible for the review was then obtained. The full text was also obtained for studies with unclear titles and abstracts. Decisions to include a publication in the review were made by two reviewers (YM, SM). This was followed by an evaluation of the full text of all papers retrieved (YM, SM). In case of any disagreement, the paper was discussed with other members of the research group.

4. Assessment of the methodological quality of the included trials

The methodological quality of the studies was assessed using processes and criteria based on the Cochrane Collaboration Handbook for Systematic Reviews of Interventions (Higgins et al., 2011). We assessed the methodological quality in the following seven domains : (1) sequence generation (2) allocation concealment (3) blinding of participants (4) blinding of outcome assessment : detection bias (5) incomplete outcome data (6) selective outcome reporting and (7) other sources of bias. The methodological quality of these domains was also assessed using the following scoring : (1) low risk of bias-presence of plausible bias unlikely to alter the results, (2) unclear risk of bias-presence of plausible bias that raises some doubt about the results, and (3) high risk of bias-presence of plausible bias that seriously weakens the confidence in the

results (Higgins et al., 2011). We used the Cochrane Handbook for Systematic Reviews of Intervention to measure publication bias and guide the process (Higgins et al., 2011). We attempted to locate the protocols of all the studies included ; but we found the protocol for only one study out of four (Smeekens et al., 2011). When no protocols were found, we used the lists of outcomes mentioned in the method section of the study and compared it to the results. Two reviewers (YM, SM) assessed the methodological quality of the eligible trials.

5. Quantitative data synthesis and Analysis

The data from the included studies were entered into Review Manager 5.3 (Cochrane, 2014), the software commonly used for Cochrane intervention reviews. For continuous outcomes, we estimated the mean difference (MD) between each group. When scales of very considerable similarity such as knowledge tests were used, we presumed there was a small difference in measurement and combined the measures. This decision was made to determine whether there is evidence in the literature that e-learning achieves desired outcomes. In this approach, standard deviation measures were used together with the sample size to compute the weight given to each study. Then, we calculated effect sizes based on the mean differences of the post-test scores. The random effect was used instead of a fixed effect to allow variations in the outcomes of the studies included. Heterogeneity was measured using I2 statistics. I2-square estimations greater than or equal to 50% were interpreted as indicating the presence of high levels of heterogeneity (Noguchi, 2015).

6. Summary of findings table

We assessed the certainty of evidence for pre-specified outcomes using the GRADEpro software (GRADEpro, 2015). We justified all decisions to downgrade or upgrade the rating using footnotes and we provided comments to help readers understand the review when necessary, as recommended by Cochrane (2020). The summary of findings for the main comparison includes the overall grading of the certainty of evidence related to each outcome according to the GRADE approach (Guyatt et al., 2011). We graded the certainty of evidence as high, moderate, low, or very low. We downgraded the initial level of confidence according to the risk of bias, the inconsistency and indirectness of evidence, the imprecision of effect estimates, and the risk of publication bias.

Ⅳ. Ethical Considerations

In compliance with copyright law, when citing documents, the source was thoroughly specified. In addition, I described the findings of the target literature and my own findings.

Ⅴ. Result

1. Search results (Trial flow)

The meta-analysis profile summarizing the flow diagram is presented in Figure 1. A total of 672 publications were identified from the databases. Out of the 672 publications, 194 were duplicates. Of the 478 publications remaining, 440 were excluded because they did not meet the inclusion criteria. Thus, 38 studies were read in full. There were 34 studies excluded due to a lack of randomized design (non-randomized design [n =20]), wrong intervention (not e-learning [n=10]), wrong population (students or patients or families [n= 3]), and no outcome of interest [n= 1]). Thus a total of four studies were included in the quantitative data analysis.

2. Methodological quality of the included trials

The methodological quality of the 4 publications included in the review varied. None of the studies were blinded. This may be due to the nature of the intervention making blinding difficult to achieve. In addition, incomplete details in the report of selective outcomes the studies as almost none of them reported the use of specific protocols. However, this was assessed as 'low risk of bias' because we assumed that the published reports included all outcomes. See Figure 2.

3. Study characteristics

The four included studies were published between 2011 and 2015 (see Table 1). All studies were reportedly randomized, although the description of the allocation varied. Three studies out of four were individual (Esche et al., 2015 ; Smeekens et al., 2011 ; Soper, 2017), and one was clustered (McCrow et al., 2014). All four studies used a parallel study design. Power calculations to estimate the adequate sample size were conducted in only two of the studies (Esche et al., 2015 ; Soper 2017). Nevertheless, the meta-analysis of the individual studies increased their statistical power by reducing the standard error of the weighted average effect size. The four studies included a total of 273 acute care

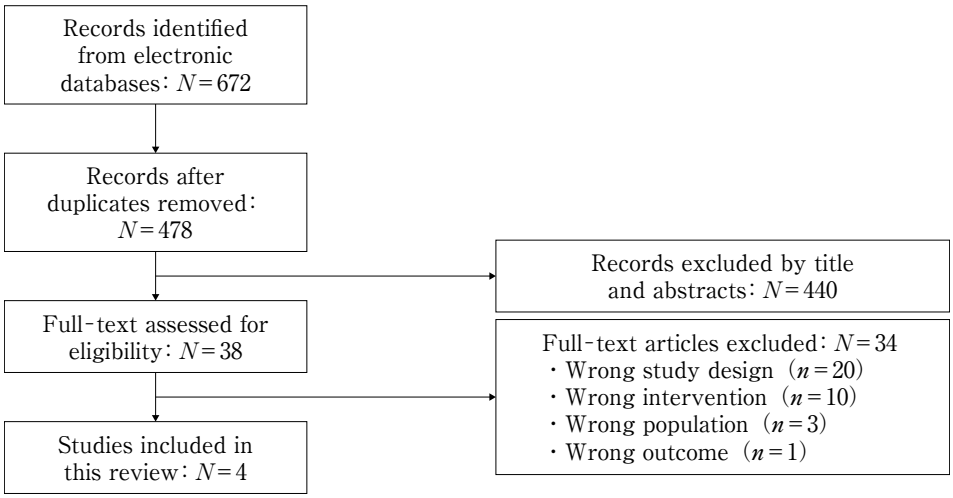

Figure 1　Flow diagram for study selection

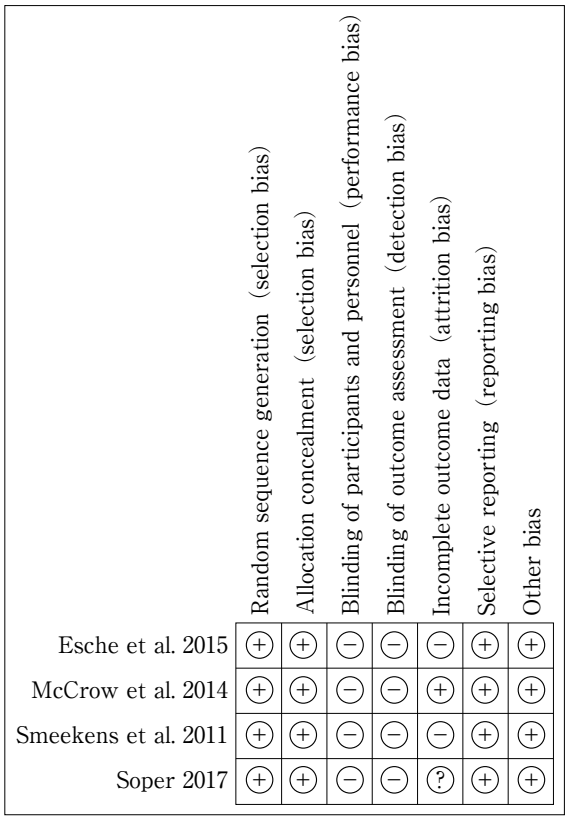

Figure 2　Risk of bias summary

nurses. Overall, the study size varied from 25 (Smeekens et al., 2011) to 147 (McCrow et al., 2014) participants and the dropout rates ranged from 0% to 69%. Smeekens et al.(2011) used previously tested and validated outcome measurements and Esche et al.(2015) used partially validated measurement. McCrow et al.(2014) used a previously developed measurement, but no reliability data is currently available for this measure. Soper (2017) used a self-developed instrument, i.e., a questionnaire developed for that particular study. Three studies used knowledge as a primary outcome measure (Esche et al., 2015 ; McCrow et al., 2014 ; Soper, 2017), while one study used performance (Smeekens et al., 2011) (Table 1). The secondary outcomes were satisfaction for Esche et al.(2015) and self-efficacy for Smeekens et al.(2011). All outcome measurements followed the same kind of scoring. Higher scores indicate a higher level of knowledge or skill performance achieved.

4. Description of the interventions

The studies included in this review used a variety of different interventions. However, all interventions used a computer program (Esche et al., 2015 ; McCrow et al., 2014 ; Smeekens et al., 2011 ; Soper, 2017). Learning methods also varied as evidenced by the differences in the way the courses were delivered, and presented, e.g., plain text, slide presentation, video, graphics, pictures, or images. All interventions were relatively short, between 60 min to 240 min. One study (McCrow et al., 2014) reported duration of five weeks for an intervention.(See Table 1) Two of the four studies (Esche et al., 2015 ; Soper, 2017) used traditional teaching as a control group for comparison to e-learning intervention. Traditional teaching refers to contact teaching such as face-to-face lecturing. The duration of the control group education varied between 120 min and 240 min and was slightly longer than the duration of the intervention group education.

Table 1 Characteristics of included studies

$N = 4$

Study	Methods	Population		Topic	Description of intervention and control learning methods						Outcome
					Intervention			Control			
Authors, country	Study design	*n*	Ward Type		method	Description of intervention	Time of intervention	Method	Description of control	Time of control	
Esche et al., 2015 U.S.	Individual	43	Acute care units	Pressure Ulcers	Computer-Based	Online modules (a) to identify risk factors for development of PrUs,(b) to accuire a basic understanding of how skin layers-function,(c) to identify prevention strategies to prevent PrUs,(d) to identify PrU stages	3 to 4 hr	Lecture	Course faculty used the online modules as a slide presentation	2 hr	Knowledge (25-questions test regarding PrU prevention and knowledge) Satisfaction (Programme Evaluation Instrument)
McCrow et al., 2014 Australia	Cluster	147	High-risk delirium areas (critical care)	Delirium	Web-based	Educational website called *learnaboutdelirium* The website included delirium facts, delirium management strategies and information about how to recognize delirium	5 weeks	—	No intervention	—	Knowledge (Nurses' Knowledge of Delirium questonnaire)
Smeekens et al., 2011 Netherlands	Individual	25	Emergency departments	Detection of child abuse	E-learning	Three different modules, recognition, acting, and communication Programme contains simulations of clinical cases, video animations and intaractive elements.	Minimum 2 hr during a 2-week period	—	No intervention	—	Skill performance (SPUTOVAMO-R, a checklist with six questions with binary answer possibilities) Self-efficacy (Visual analogue scale)
Soper, 2017 U.S.	Individual	58	Acute care and chest pain accreditation	Acute Coronary Syndrome	E-learning	Teacher-guided e-learning	4 hr	Lecture	Lecture (E-learning and Lecture have similar goals and objectives)	4 hr	Knowledge (Acute Coronary Syndromes quiz)

5. Quantitative data synthesis

1) Impact of e-learning on knowledge level

Three studies (248 participants) reported the outcomes of e-learning on participants' knowledge (Esche et al., 2015 ; McCrow et al., 2014 ; Soper, 2017). Two of these studies (205 participants) could be used for meta-analysis (McCrow et al., 2014 ; Soper, 2017) ; but the study by Esche et al.(2015) (43 participants) had to be excluded from the quantitative meta-analysis due to lack of numerical data. The random effect size showed some improvement associated with e-learning compared to traditional learning, however, the result was not statistically significant (2 studies, 205 participants : $p = 0.85$, MD 0.38, 95%CI [−3.48 to 4.25]) (Figure 3).

We graded the quality of evidence as very low for this outcome.

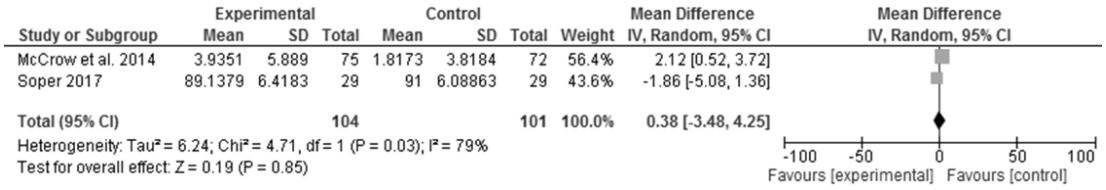

Figure 3　Meta-analysis of studies comparing e-learning to traditional learning : Knowledge

2）Impact of e-learning on skill performance

Smeekens et al.(2011)（25 participants）reported the outcome of e-learning on participants' skill performance levels. They showed a slight impact of e-learning which was statistically significant（1 study, 25 participants：p =0.02, MD 18.00, 95%CI［3.50 to 32.50］).

3）Impact of e-learning on satisfaction

Esche et al.(2015)（43 participants）reported the participants' satisfaction with the different learning methods. However, no significant increase in satisfaction was observed（1 study, 43 participants：p =0.74, MD 0.50, 95%CI［−2.46 to 3.46］).

4）Impact of e-learning on self-efficacy

Smeekens et al.(2011)（25 participants）reported on participants' self-efficacy with the different learning methods. However, no significant increase in self-efficacy was observed（1 study, 25 participants：p =0.16, MD 55.00, 95% CI［−21.14 to 131.14］).

6．A summary of findings table showing the quality of evidence

As mentioned above, all outcomes were graded as very low evidence. This was due to the small sample size, the high risk of bias, and the lack of blinding of the studies.

Ⅵ. Discussion

The e-learning group has a significantly higher score of skill performance than the traditional learning group. However, due to the large heterogeneity between the studies and the very low-certainty evidence, the meta-analysis has to be interpreted with caution. It may be difficult to generalize the effect of e-learning on acute care nurses.

In some systematic reviews/meta-analysis measuring the impact of e-learning for healthcare professionals such as nurses, the results show that individuals in e-learning groups have a significantly higher knowledge score than the ones in traditional learning groups (Voutilainen, et al., 2017). However, there is no difference in knowledge acquisition between e-learning and traditional learning in other studies（Lahti et al., 2014；Horiuchi et al., 2009). In other words, the results vary. The conceptual heterogeneity is likely due to differences in nurses' attributes and study design (e.g., observation period, endpoint). Because meta-analyses are conceptually and statistically heterogeneous, we suggest the use of meta-regression to uncover the factors that cause variation in the e-learning outcomes. Higher quality RCT studies should also be conducted.

1．Strength and limitations of the review

The strength of this review relies on its systematic approach to search, screen and review studies, to extract data using standardized forms, and to duplicate all stages. Important gaps in research design were identified through the systematic approach and meta-analysis. Additionally, SRs describing the impact of e-learning specifically on only acute care nurses have not been published to date. However, only studies in English were included, therefore significant findings may have been missed.

2．Implication for practice

Nurses need both knowledge and skill. But, it can be difficult to improve both knowledge and skills with e-learning alone. Additionally, the dropout rates in the studies included in this systematic review ranged from 0% to 69%, in other words, some studies had a high dropout rates. Blended learning prevents learners' isolation and dropouts because it includes face-to-face lessons（Harashima, 2009). This method is also favorably received by students (Kougo et al., 2012), which is why we think that combining e-learning and face-to-face lessons may be more effective.

3．Implication for research

The results of this paper will be useful for the content and outcome measurement of continuing education for acute care nurses. Most studies investigated e-learning with a small sample size, so further investigation with a larger sample size and more outcomes is needed. We must also address the use of self-developed

instruments and develop reliable and valid measurement instruments.

It is also necessary to measure outcomes at multiple time points, to include long-term evaluations, and to measure nurses' outcomes as well as patient outcomes. Many papers did not report the data needed for meta-analysis even though the outcomes were listed.

Effect sizes were not calculated in the original studies. The authors drew their conclusions on the basis of P-values. P-values cannot be compared across studies or even across different tests within the same study. More studies following the CONSORT statements are needed to evaluate the effect of these interventions. Therefore, there is still a need for further studies to assess the impact of e-learning in the continuing education of acute care nurses.

4. Certainty of evidence

Performance bias, detection bias, and attrition bias were high. The high performance and detection bias may be due to the nature of the intervention that renders blinding difficult to achieve. The high attrition bias may be the result of the high number of participants who withdrew from or dropped out of the studies (0-69% in four trials). The lack of follow-up may have introduced imbalances between the groups included in the analyses.

Ⅶ. Conclusion

We showed that the effect on skill performance was significantly higher with e-learning than traditional learning. In addition, we did not observe any statistical difference between groups for acute care nurses' knowledge, satisfaction, and self-efficacy.

The small sample sizes of the included studies and the variation in e-learning interventions and effects show that there is still a need for higher quality RCT studies to assess the impacts of e-learning for the continuing education of acute care nurses. It may be difficult to improve both knowledge and skills with e-learning alone. We think that combining e-learning and face-to-face lessons may be more effective.

Conflict of interest

The authors have no conflicts of interest directly relevant to the content of this article.

Acknowledgment

We are grateful to Professor Ota Erika and Associate Professor Okubo Nobuko, College of Nursing of St. Luke's International University for their generous support and helpful discussions and comments on the manuscript. Sarah E Porter PhD MS MPH RN provided editorial assistance.

References

Bredesen, IM, Bjøro K, Gunningberg L, et al.(2016) : Effect of e-learning program on risk assessment and pressure ulcer classification ; A randomized study. *Nurse Education Today*, 40 : 191-197.

Cochrane (2014) : *Review Manager 5.3*. https://training.cochrane.org/online-learning/core-software-cochrane-reviews/revman (2020/2/10).

Cochrane (2020) : *Cochrane Library*. https://www.cochranelibrary.com/(2020/2/10).

Esche CA, Warren JI, Woods AB, et al.(2015) : Traditional Classroom Education Versus Computer-Based Learning ; How nurses Learn About Pressure Ulcers. *Journal of for Nurses in Professional Development*, 31 (1) : 21-27.

Forsman H, Rudman A, Gustavsson P, et al.(2010) : Use of research by nurses during their first two years after graduating. *Journal of Advanced Nursing*, 66 (4) : 878-890.

GRADEpro.(2015) : *GRADEpro software*. https://gradepro.org/(2020/2/10).

Guyatt GH, Oxman AD, Vist G, et al.(2011) : GRADE guidelines : 4. Rating the quality of evidence- study limitations (risk of bias). *Journal of Clinical Epidemiology*, 64 (4) : 407-415.

Harashima H (2009) : Chapter 6 Blended Learning. *From-learning to Blended Learning*, Miyaji I(Ed.), 93-122, KYORITSU SHUPPAN, Tokyo (in Japanese).

Higgins JPT, Green S (2011) : *Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0*. The Cochrane Collaboration.

Horiuchi S, Yajyu Y, Koyo M, et al.(2009) : Evaluation of a web-based graduate continuing nursing education program in Japan ; A randomized controlled trial. *Nurse Education Today*, 29 (2) : 140-149.

Kougo C, Tominaga A, Ishikawa N (2012) : Design and practice of blended learning combining e-learning and group work at university. *Japan Journal of Educational Technology*, 36 (3) : 281-290 (in Japanese).

Lahti M, Hätönen H, Välimäki M (2014) : Impact of e-learning on nurses' and student nurses' knowledge, skills, and satisfaction ; A systematic review and meta-analysis. *International Journal of Nursing Studies*, 51 (1) : 136-149.

McCrow J, Sullivan KA, Beattie ER (2014) : Delirium knowledge and recognition ; A randomized controlled trial of a web-based educational intervention for acute care nurses. *Nurse Education Today*, 34 : 912-917.

Morente L, Morales-Asencio JM, Veredas FJ (2013) : Effectiveness of an e-learning tool for education on pressure ulcer evaluation. *Journal of Clinical Nursing*, 23 : 2043-2052.

Noguchi Z (2015) : *The first meta-analysis ; An introduction*

to clinical research without spending money. 36–39, Institute for Health Outcomes & Process Evaluation research, Tokyo（in Japanese）.
Smeekens, AEFN, Broekhuijsen-van Henten DM, Sittig JS, et al（2011）：Successful e-learning programme on the detection of child abuse in Emergency Departments；A randomized controlled trial. *Archives of Disease in Childhood*, 96：330–334.
Soper T（2017）：Knowledge into learning：comparing lecture, e-learning and self-study take-home packet instructional methodologies with nurses. *Nursing Open*, 4：76–83.
Tominaga A, Kougo C（2014）：Progress and issues of practical research on e-learning. *The Annual report of Educational Psychology in Japan*, 53：156–165（in Japanese）.
Voutilainen A, Terhi S, Sormunen M（2017）：Conventional vs. e-learning in nursing education；A systematic review and meta-analysis. *Nurse Education Today*, 50：97–103.

和文抄録

急性期領域臨床看護師の継続教育におけるｅラーニングの有効性に関するシステマティックレビュー

安田みなみ，鈴木みゆき
聖路加国際大学大学院看護学研究科博士後期課程

目的：新人看護師が基礎教育の学習内容を看護実践に生かしにくいといわれている．患者の状態が深刻で大きく変化する急性期領域においては，基礎教育で学習した知識の活用に困難を感じる看護師が特に多いと推測され，臨床で活用できる形での知識の獲得が必要と考える．ｅラーニングは，時間や場所を問わず利用でき，従来の対面授業と同等の効果があるなどの利点が多いことから，看護師向けの継続教育においても多く用いられている．しかし，特定の看護実践領域に絞ってｅラーニングの効果をみたシステマティックレビューは行われていない．今回は，急性期領域看護師向けのｅラーニングによる継続教育の知識，スキル，満足度，自己効力感への影響を評価し，ｅラーニングの有効性を評価する．

方法：ランダム化比較試験の系統的レビューとメタ分析を実施した．対象データベースはMEDLINE，EMBASE，PubMed，CINAHL，PsycINFO，ERIC，CENTRALとし，2019年11月までに出版された英語文献を対象とした．Cochrane Collaboration Handbook for Systematic Review of Interventionsを用いて各研究のバイアスのリスクを判定し研究の質を評価した．学習効果の平均差を計算するため，ランダム固定効果によるメタ分析を実行した．GRADEアプローチを使用してエビデンスの質を評価した．

結果：合計273人の看護師を含む４つのランダム化比較試験が抽出された．知識，満足度および自己効力感について，従来の学習とｅラーニングとの間に有意差は認められなかった．スキルはｅラーニング群において有意に増加が認められた．しかし，研究間の不均一性は大きく，GRADEアプローチによるエビデンスは非常に低い結果であった．その理由は，研究に含まれるサンプルサイズが小さく，バイアスのリスクが高く，盲検化されていなかったためである．

考察・結論：ｅラーニングの効果を正確に評価するためには，より大きなサンプルサイズによる研究と，CONSORT声明に沿ったさらなる研究が必要である．ｅラーニング単独では知識とスキルの双方を向上させることは難しい可能性があることから，ｅラーニングと従来の対面授業とを組み合わせたブレンド学習が効果的である可能性が示唆された．

キーワード：ｅラーニング，急性期，臨床看護師，システマティックレビュー，メタアナリシス