General analysis of the benefits of flexible/ distance/ digital/ technology enhanced learning

We requested literature search/review of existing online/digital/flexible/blended nursing degrees in the UK and internationally. Specifically, we wanted to look at degree courses that allow continued working, with academic elements delivered online/digitally. In addition to nursing degrees, any medical degrees that operated in a similar way were deemed to be of potential interest. Any course that provided practical, contextual/environmental working or work placements coupled with flexible, digital/online academic learning was of interest and we asked for any related to healthcare specifically to be included but acknowledged that lessons could/should be learned from other professions and for any examples here to be included also..

We asked for descriptive detail on courses - entry requirements, time-scale, partner organisations, work placement details etc plus outcomes. We also asked for a search for any analysis on any of these courses as to effectiveness and any more general analysis on the benefits of flexible/distance/digital/technology enhanced learning

Relevant Terminology: Blended learning/Study;Flexible Learning/Study; Digital learning/Study; Online learning/Study; Online nursing degree; Flexible nursing degree; Digital nursing degree; Contexualised learning; Mobile learning; Distance learning; work-based learning/study; technology enhanced learning

Our priorities in directing the search were as below:

1. UK, Nursing related
2. Anywhere, Nursing related
3. UK, Medicine/Healthcare related
4. Anywhere, Medicine/Healthcare related
5. UK, digital/online/work-based/flexible learning - any profession
6. Anywhere, digital/online/work-based/flexible learning - any profession

	Citation detail	Notes/ Abstract	Link
Systematic Reviews – Nursing			
1	A systematic review of online learning programs for nurse preceptors January 2018 Nurse Education Today	BACKGROUND Nurse preceptors guide students to integrate theory into practice, teach clinical skills, assess clinical competency, and enhance problem solving skills. Managing the dual roles of a registered nurse and preceptor poses tremendous challenges to many preceptors. Online learning is recognized as an effective learning approach for enhancing nursing knowledge and skills. OBJECTIVE The systematic review aims to review and synthesise the online learning programs for preceptors. DESIGN A systematic review was designed based on the Cochrane Handbook for Systematic Reviews of Programs. DATA SOURCES Articles published between January 2000 and June 2016 were sought from six electronic databases: CINAHL, Medline OVID, PubMed, Science Direct, Scopus, and Web of Science. METHODS All papers were reviewed and quality assessment was performed. Nine studies were finally selected. Data were extracted, organized and analysed using a narrative synthesis. RESULTS The review identified five overarching themes: development of the online learning programs for nurse preceptors, major contents of the programs, uniqueness of each program, modes of delivery, and outcomes of the programs. CONCLUSION The systematic review provides insightful information on educational programs for preceptors. At this information age, online learning offers accessibility, convenience, flexibility, which could of great advantage for the working adults. In addition, the online platform provides an alternative for preceptors who face challenges of workload, time, and support system. Therefore, it is paramount that continuing education courses need to be integrated with technology, increase the flexibility and responsiveness of the nursing workforce, and offer alternative means to take up courses.	
2	A systematic review evaluating the impact of online or blended learning vs. face-to-face learning of clinical skills in undergraduate nurse education. February 2015	AIM To determine whether the use of an online or blended learning paradigm has the potential to enhance the teaching of clinical skills in undergraduate nursing. BACKGROUND The need to adequately support and develop students in clinical skills is now arguably more important than previously considered due to reductions in practice opportunities. Online and blended teaching methods are being developed to try and meet this requirement, but knowledge about their effectiveness in teaching clinical skills is limited.	Link

	Journal of Advanced Nursing	DESIGN Mixed methods systematic review, which follows the Joanna Briggs Institute User guide version 5. DATA SOURCES Computerized searches of five databases were undertaken for the period 1995-August 2013. REVIEW METHODS Critical appraisal and data extraction were undertaken using Joanna Briggs Institute tools for experimental/observational studies and interpretative and critical research. A narrative synthesis was used to report results. RESULTS Nineteen published papers were identified. Seventeen papers reported on online approaches and only two papers reported on a blended approach. The synthesis of findings focused on the following four areas: performance/clinical skill, knowledge, self-efficacy/clinical confidence and user experience/satisfaction. The e-learning interventions used varied throughout all the studies. CONCLUSION The available evidence suggests that online learning for teaching clinical skills is no less effective than traditional means. Highlighted by this review is the lack of available evidence on the implementation of a blended learning approach to teaching clinical skills in undergraduate nurse education. Further research is required to assess the effectiveness of this teaching methodology.	
3	Effectiveness of Online Cancer Education for Nurses and Allied Health Professionals; a Systematic Review Using Kirkpatrick Evaluation Framework. December 2017 Journal of Cancer Education	Embedding online learning within higher education can provide engaging, cost-effective, interactive and flexible education. By evaluating the impact, outcomes and pedagogical influence of online cancer and education, future curricula can be shaped and delivered by higher education providers to better meet learner, health care provider and educational commissioners' requirements for enhanced patient care and service delivery needs. Using the Kirkpatrick's four-level model of educational evaluation, a systematic review of the effectiveness of online cancer education for nurses and allied health professionals was conducted. From 101 articles, 30 papers were included in the review. Educational theory is not always employed. There is an absence of longitudinal studies to examine impact; an absence of reliability and/or validity testing of measures, limited experimental designs taking account of power and few attempts to mitigate bias. There is, however, an emerging innovative use of mobile/spaced learning techniques. Evidence for clinical and educational effectiveness is weak offering insights into experiences and participant	

		perceptions rather than concrete quantitative data and patient-reported outcomes. More pedagogical research is merited to inform effective evaluation of online cancer education, which incorporates and demonstrates a longer-term impact.	
	A systematic review examining the effectiveness of blending technology with team-based learning October 2016 Nurse Education Today	BACKGROUND Technological advancements are rapidly changing nursing education in higher education settings. Nursing academics are enthusiastically blending technology with active learning approaches such as Team Based Learning (TBL). While the educational outcomes of TBL are well documented, the value of blending technology with TBL (blended-TBL) remains unclear. This paper presents a systematic review examining the effectiveness of blended-TBL in higher education health disciplines. OBJECTIVES This paper aimed to identify how technology has been incorporated into TBL in higher education health disciplines. It also sought to evaluate the educational outcomes of blended-TBL in terms of student learning and preference. METHOD A review of TBL research in Medline, CINAHL, ERIC and Embase databases was undertaken including the search terms, team based learning, nursing, health science, medical, pharmaceutical, allied health education and allied health education. Papers were appraised using the Critical Appraisal Skills Program (CASP). RESULTS The final review included 9 papers involving 2094 student participants. A variety of technologies were blended with TBL including interactive eLearning and social media. CONCLUSION There is limited evidence that blended-TBL improved student learning outcomes or student preference. Enthusiasm to blend technology with TBL may not be as well founded as initially thought. However, few studies explicitly examined the value of incorporating technology into TBL. There is a clear need for research that can discern the impact of technology into TBL on student preference and learning outcomes, with a particular focus on barriers to student participation with online learning components.	Link
Nursing			

4	Distance Learning Can Be as Effective as Traditional Learning for Medical Students in the Initial Assessment of Trauma Patients September 2016 Acra Medica Iranica	Distance learning is expanding and replacing the traditional academic medical settings. Managing trauma patients seems to be a prerequisite skill for medical students. This study has been done to evaluate the efficiency of distance learning on performing the initial assessment and management in trauma patients, compared with the traditional learning among senior medical students. One hundred and twenty senior medical students enrolled in this single-blind quasi-experimental study and were equally divided into the experimental (distance learning) and control group (traditional learning). All participants did a written MCQ before the study. The control group attended a workshop with a 50-minute lecture on initial management of trauma patients and a case simulation scenario followed by a hands-on session. On the other hand, the experimental group was given a DVD with a similar 50-minute lecture and a case simulation scenario, and they also attended a hands-on session to practice the skills. Both groups were evaluated by a trauma station in an objective structured clinical examination (OSCE) after a month. The performance in the experimental group was statistically better (P=0.001) in OSCE. Distance learning seems to be an appropriate adjunct to traditional learning.	Link (Athens log in required)
5	Evaluation of Online Learning Modules for Improving Physical Activity Counseling Skills, Practices, and Knowledge of Oncology Nurses. November 2017 Oncology Nursing Forum	PURPOSE/OBJECTIVES To examine the effectiveness of online learning modules for improving physical activity counseling practices among oncology nurses. DESIGN Randomized, controlled trial. SETTING Online. SAMPLE 54 oncology nurses.[P SEP]. METHODS Oncology nurses were randomly assigned to the learning modules group or control group. The learning modules group completed six online learning modules and quizzes focused on physical activity for cancer survivors, general physical activity principles, and motivational interviewing.[P SEP]. MAIN RESEARCH VARIABLES Percentage of cancer survivors counseled, self-efficacy for physical activity counseling, knowledge of physical activity, and perceived barriers and benefits of physical activity counseling.[P SEP].FINDINGS Analyses of covariance revealed no significant difference between the learning modules and control groups in the percentage of cancer survivors that oncology nurses counseled. Significant differences were found in self-efficacy for physical activity counseling and perceived barriers to physical activity counseling at postintervention. [P SEP]. CONCLUSIONS The online learning intervention tested in this study improved some parameters of physical activity counseling but did not increase the percentage of cancer survivors that oncology nurses counseled. Additional pilot work is needed to refine the intervention.[P SEP].	Link (Athens log in required)

		IMPLICATIONS FOR NURSING This study suggests the potential utility of an evidence-based online learning strategy for oncology nurses that includes information on physical activity and its benefits in cancer survivorship. The findings offer a framework on how to implement physical activity counseling skills in oncology nursing practice.	
6	Flexible learning: Evaluation of an international distance education programme designed to build the learning and teaching capacity of nurse academics in a developing country. November 2016 Nurse Education in Practice	The professional development of nurse academics has been high on the agenda in many of the Asia-Pacific's developing countries including Vietnam. In collaboration with the Vietnamese Nurses Association, an Australian university designed and delivered a distance learning programme (DLP). The DLP sought to build academic capacity with a specific focus on the skills required to develop, implement and deliver a new national nursing curriculum. This paper will describe the design and delivery of the DLP as well as report on programme evaluation survey findings. Of the 175 surveys administered 112 were returned yielding a response rate of 64%. The majority of Vietnamese nurse academics identified all DLP modules as 'very well' designed and easy to learn from (range 63.9%-84.2%). Predominantly, academics also found the module content to be 'of great use' to their professional practice (range 73%-89.5%). Asked specifically about the benefit of the DLP online discussions, 106 (95.5%) participants stated they found the online discussions to be of use. An explanatory comment was also requested to explore this question and responses yielded three themes: 'networking and collaboration'; 'acquiring new knowledge'; and 'improving English'. When asked if they had changed their academic practice as a result of DLP participation, 105 (94.6%) academics stated they had - change was focussed on student centred learning and building a staff community of practice. While these study results indicate the DLP to be successful, it will be how Vietnamese academics utilise and build these skills which will measure the real success of the programme in the future.	
7	Online or In-Class: Evaluating an Alternative Online Pedagogy for Teaching Transcultural Nursing. June 2017 The Journal of Nursing Education	BACKGROUND Online learning formats are prevalent in current higher education. Given the changing student demographics and the drive for creativity in educating a technology-savvy student, it is imperative to incorporate innovative and alternative learning modalities to engage these students. METHOD This pilot study was designed as a quality improvement program evaluation comparing the effects of an online learning module with traditional classroom delivery of transcultural nursing content using a posttest two-group survey design in associate degree nursing students. The students' perceived knowledge and confidence were investigated after receiving the lecture for both the online and in-class groups.	Link (Athens log in required)

		RESULTS Data analysis revealed the online cohort perceived themselves as more knowledgeable concerning the ways that cultural factors influence nursing care, but not more confident in providing culturally competent care. CONCLUSION Due to the students' perceived knowledge gain, this pilot study supports the use of online learning modules as being more effective than the traditional classroom delivery of transcultural nursing content. [J Nurs Educ. 2017;56(6):368-372.].	
8	Who can benefit more from massive open online courses? A prospective cohort study May 2019 Nurse Education Today	BACKGROUND Massive open online courses (MOOCs) are innovative courses that have aroused great interest in the field of nursing education. However, most studies have focused only on the benefits of MOOCs rather than the issues and how to ameliorate them. OBJECTIVES To compare the differences between the "blended learners" (who studied at a university and via a MOOC) and "social learners" (MOOC-only learners) in course completion, participation, performance, and online interactions. DESIGN A prospective cohort study. SETTINGS AND PARTICIPANTS The participants were social and blended learners registered on a 16-week Health Assessment MOOC on a Chinese MOOC platform. METHODS The data were collected from the MOOC learning records. The participants were categorized based on their participation: Committed learners (participated in all topic tests and the final exam), Early dropout learners (initially participated but did not finish the course), and Other learners (the remainder). The differences in course completion, participation, performance, and online interactions (in three case discussions and free discussions) between the blended and social learners, and among the three participation types, were assessed. RESULTS At total of 4106 participants registered, comprising 57 blended and 4049 social learners. The completion rates for blended and social learners were 100% and 7.14%, respectively. The blended learners showed stable participation rates over the course ($\chi2 = 0.190$, $P = 0.663$) while the social learners showed a trend of high to low participation ($\chi2 = 179.602$, $P < 0.001$). The blended learners had better performance than the social learners (all $P < 0.05$) except among the committed learners. The blended learners also had more online interactions than the social learners ($\chi2 = 25.107$, $P < 0.001$). The Early dropout and Other learners among the social learners participated more in the free discussions than the case discussions ($P < 0.001$).	

		CONCLUSION Blended learners benefit more from MOOCs than social learners, and online-to-offline blended approaches are recommended for future nursing education.	
9	The effectiveness of an e-learning course on medication calculation in nursing students: a clustered quasi-experimental study. September 2016 Journal of Advanced Nursing	AIM To evaluate the effectiveness of an e-learning course compared with a face-to-face lecture on medication calculation. BACKGROUND The current knowledge on medication calculation of nursing students and nurses is insufficient to provide safe care. DESIGN A stratified-clustered quasi-experimental study. METHODS A random selection of nursing schools were allocated to the e-learning course (intervention group) (seven schools; 189 students) or face-to-face lecture (control group) (six schools, 222 students). Students in both groups completed a validated medication calculation test (maximum score: 16) prior to the course (T0), immediately after the course (T1) and 3 months later (T2). A linear mixed model was used for data analysis. RESULTS Medication calculation skills improved significantly more by the face-to-face lecture than e-learning course. Students in both groups significantly improved in medication calculation skills immediately after the course (T1) and 3 months later. The results flattened at T2 with a significant decline in the intervention group between T1 and T2 and a non-significant decline in the control group. Based on a subgroup analysis, improvement in medication calculation skills at T2 could only be observed in vocational-level (sub degree) nursing students receiving a face-to-face course. CONCLUSIONS Both medication calculation courses had a positive effect on medication calculation skills. Students receiving traditional face-to-face lecture improved significantly more than the students receiving the e-learning course.	Link
10	Benefits and Challenges of Teaching Nursing Online: Exploring Perspectives of Different Stakeholders. August 2016 The Journal of Nursing Education	BACKGROUND Recruiting and retaining faculty to teach courses is crucial for online nursing programs to succeed. The purpose of this study was to gain a fuller understanding of the benefits and challenges of teaching nursing courses online by exploring the perspectives of faculty, administrators, and instructional designers at three schools of nursing in the southeastern United States. METHOD This qualitative multiple case study explored perspectives of 21 participants from different stakeholder groups. Researchers used cross-case analysis and determined emerging themes in data collected from interviews, course demonstrations, and course documents. RESULTS Data analysis revealed themes regarding benefits and challenges for nursing instructors in (a) teaching strategies, (b) instructor availability, (c) training and support, and (d) institutional issues.	Link (Athens log in required)

		CONCLUSION This study found gaps in perspectives between participant groups that indicated a need for institutions to address communication issues, training program objectives, and institutional policies and procedures regarding online course design and delivery to promote faculty success and satisfaction. [J Nurs Educ. 2016;55(8):433-440.].	
11	Effective strategies for successful online students. December 2017 Nurse Education Today	•Effective online strategies •Weekly announcements •Timely reminders •Tracking interaction	
12	Effect of education using the virtual social network on the knowledge and attitude of emergency nurses of disaster preparedness: A quasi-experiment study February 2019 Nurse Education Today	BACKGROUND Nurses play an important role in helping people to cope with disasters. Dealing with disasters requires proper knowledge, attitudes and skills that can be achieved through education. Education through virtual social networks as a method of distance education can be used due to its accessibility and ease of use. OBJECTIVES To investigate the effect of education using the virtual social network on the knowledge and attitude of emergency nurses of disaster preparedness. DESIGN This was a pre-test and post-test quasi-experimental study with a control group. SETTING The study was conducted in two hospitals in Tehran, Iran. PARTICIPANTS A total of 60 nurses (n = 30 nurses in each group) participated in this study. Before the study, they signed the informed consent form. METHODS They were selected using a census method and were divided into two control (n = 30) and intervention groups (n = 30). Data was collected before and after the intervention using the disaster preparedness questionnaire. The intervention group received 34-session education of disaster preparedness via the virtual social network (Telegram application). Data was analyzed using descriptive and inferential statistics via the SPSS v.22 software. RESULTS No statistically significant difference was reported between the groups regarding the pretest knowledge score, but the posttest knowledge score was significantly higher in the intervention group compared to the control group ($p < 0.001$). In the intervention group, knowledge scores significantly increased at the posttest compared to the pretest ($p < 0.01$). No a similar condition happened in the control group. While the posttest attitude score was higher than the pretest attitude score, it was not statistically significant.	

		CONCLUSIONS A significant increase in the knowledge score of the intervention group was reported compared to the control group indicating the effectiveness of learning through the virtual social network. Also, the high level of attitude scores before and after education indicated the positive attitude of emergency nurses toward the need for disaster preparedness.	
13	Mental Health Education and Virtual Learning Environments (VLEs) in Pre-registration Nursing Degrees: Follow the Leaders? May 2015 Issues in Mental Health Nursing	Virtual learning environments (VLEs) are now commonly used, worldwide, as teaching and learning platforms for pre-registration nursing education. However, there is only limited evidence in the research literature to suggest that VLEs are employed to support the education of student nurses about mental health and illness. This article describes the work of mental health nurse educators who have taken the lead by providing case-based simulations on VLEs, thereby enabling students to acquire knowledge and develop the clinical skills required for practice in mental health settings. Benefits of VLEs include their flexibility and accessibility, and also the opportunity they provide for students to engage with Web 2.0 technologies. Leadership in education must include the utilization of the most current pedagogical tools and strategies, as well as staying abreast of contemporary evidence-based practices in clinical settings, to support the knowledge acquisition and practice-based learning of the registered nurses (RNs) of the future.	
14	Developing and evaluating an online learning tool to improve midwives' accuracy of visual estimation of blood loss during waterbirth: An experimental study. January 2019 Midwifery	Abstract Objective The principal objective was to test the effectiveness of an online learning tool to improve midwives' accuracy of blood loss estimations in a birthing pool environment. The secondary objective was to assess the acceptability of the online learning tool to the midwives using it. Design A one group pre-test, post-test experiment with immediate and six weeks follow-up to test ability together with an online questionnaire to assess perceived usefulness of an online learning tool. Setting A large NHS maternity hospital comprising an acute care obstetric unit, a small district unit labour ward, one alongside midwifery-led unit and three freestanding midwifery-led units. Participants Volunteer NHS employed midwives who had experience in caring for women labouring and giving birth in water (n = 24). Intervention An online learning tool comprising six randomly ordered short video simulations of blood loss in a birthing pool in real time, and a tutorial giving verbal and pictorial guidance on making accurate blood loss estimations in water was developed then piloted. Midwives' accuracy scores for estimating blood loss in each of the videos were calculated at three timepoints; pre and immediately post the learning component, and six weeks later. The estimated blood loss volume was subtracted from the actual blood loss volume, to give the difference	

		between estimated and real blood loss in millilitres (ml) which was then converted to percentage difference to standardise comparison across the six volumes. The differences between pre- and post-learning for each of the six blood volumes was analysed using a repeated measures ANOVA. Statistical significance was set at $p < 0.05$. An online questionnaire incorporated questions using Likert scales to gauge confidence and competence and free text. Free text responses were analysed using a modified form of inductive content analysis. Findings Twenty-two midwives completed the online learning and immediate post-test, 14 completed a post-test after six weeks, and 15 responded to the online questionnaire. Pre-test results showed under-estimation of all blood loss volumes and particularly for the two largest volumes (1000 and 1100 ml). Across all volumes, accuracy of estimation was significantly improved at post-test 1. Accuracy diminished slightly, but overall improvement remained, at post-test 2. Participants rated the online tool positively and made suggestions for refining it. Key conclusions and implications for practice This is the first study measuring the accuracy of midwives' blood loss estimations in a birthing pool using real-time simulations and testing the effectiveness of an online learning tool to improve this important skill. Our findings indicate a need to develop interventions to improve midwives' accuracy at visually estimating blood loss in water, and the potential of an online approach. Most women who labour and/or give birth in water do so in midwifery-led settings without immediate access to medical support. Accuracy in blood loss estimations is an essential core skill	
15	Midwifery education and technology enhanced learning: Evaluating online story telling in preregistration midwifery education. March 2018 Nurse Education Today	Background A major issue regarding the implementation of blended learning for preregistration health programmes is the analysis of students' perceptions and attitudes towards their learning. It is the extent of the embedding of Technology Enhanced Learning (TEL) into the higher education curriculum that makes this analysis so vital. Objectives This paper reports on the quantitative results of a UK based study that was set up to respond to the apparent disconnect between technology enhanced education provision and reliable student evaluation of this mode of learning. Design Employing a mixed methods research design, the research described here was carried to develop a reliable and valid evaluation tool to measure acceptability of and satisfaction with a blended learning approach, specifically designed for a preregistration midwifery module offered at level 4.	

		Methods Feasibility testing of 46 completed blended learning evaluation questionnaires - Student Midwife Evaluation of Online Learning Effectiveness (SMEOLE) - using descriptive statistics, reliability and internal consistency tests. Results Standard deviations and mean scores all followed predicted pattern. Results from the reliability and internal consistency testing confirm the feasibility of SMEOLE as an effective tool for measuring student satisfaction with a blended learning approach to preregistration learning. Conclusions The analysis presented in this paper suggests that we have been successful in our aim to produce an evaluation tool capable of assessing the quality of technology enhanced, University level learning in Midwifery. This work can provide future benchmarking against which midwifery, and other health, blended learning curriculum planning could be structured and evaluated.	
16	Flexible pathway into the profession for support staff. July 2017 Nursing Standard	The article focuses on the pre-registration training provided to healthcare support workers in Wales while continuing to work. Topics covered include the benefit of combined distance and practice learning to students, the advantages of the training for health boards and the legacy of learning the approach gives to the health board and the flexibility of pathways for the university.	
17	A distance-learning journey from healthcare assistant to registered nurse. July 2016 British Journal of Healthcare Assistants	This article discusses the findings from a naturalistic case study that explored the views of final year, distance learning university, practice-based student nurses on their preparation for the role of registered nurse. The students were all healthcare assistants (HCAs), who were sponsored by their employers on the DipHE Adult Nursing Pre Registration Nursing Programme (PRNP). The findings and themes that evolved from this study show the significant areas that informed these student nurses' journeys and their preparation to become registered nurses. The practice areas had a vested interest in preparing these sponsored students to be competent, skilled practitioners, as they were 'growing' their own workforce. The study reported that all of the students obtained posts as Newly Qualified (NQ) nurses, 80% in the practice areas where they were dual-role HCA/students, thereby demonstrating the effectiveness of the PRNP working in partnership with employers to support workforce development.	
18	Effects of team-based learning on self-regulated online learning April 2015	Online learning requires higher levels of self-regulation in order to achieve optimal learning outcomes. As nursing education moves further into the blended and online learning venue, new teaching/learning strategies will be required to develop and enhance self-regulated learning skills in nursing students. The purpose of this study was to compare the effectiveness of team-based learning (TBL) with traditional instructor-led (IL) learning, on self-regulated online learning	

	International Journal of Nursing Education	outcomes, in a blended undergraduate research and evidence-based practice course. The nonrandomized sample consisted of 98 students enrolled in the IL control group and 86 students enrolled in the TBL intervention group. The percentage of total possible online viewing time was used as the measure of self-regulated online learning activity. The TBL group demonstrated a significantly higher percentage ($p < 0.001$) of self-regulated learning activities than the IL control group. The TBL group scored significantly higher on the course examinations ($p = 0.003$). The findings indicate that TBL is an effective instructional strategy that can be used to achieve the essential outcomes of baccalaureate nursing education by increasing self-regulated learning capabilities in nursing students.	
19	Distance learning for maternal and child health nurses and midwives in Mongolia: a qualitative evaluation. December 2018 International Nursing Review	BACKGROUND Continuing education is vital for the development of the competencies of nurses and midwives. We analysed the effectiveness of a distance education programme for maternal and child health nurses and midwives in Mongolia, assessing its strengths and limitations and ways in which it could be improved. The aim of this research is to provide an analysis of the successes and failures of the programme, in order to improve future versions of this and similar programmes in Mongolia and elsewhere. METHODS We carried out a qualitative descriptive study in Mongolia in August 2015. This consisted of three semi-structured interviews and two focus groups in the Second National Hospital, Ulaanbaatar, and three semi-structured interviews and one focus group in Dornogovi Provincial Maternal Hospital, Sainshand, Dornogovi Province. In total, there were 22 participants in our research. Data from the interviews and focus groups were thematically coded and analysed using NVivo version 10. FINDINGS The distance education programme is well received by participants. They suggest that it has improved their clinical practice and education in a number of areas, and are anxious for the programme to continue. A number of alterations would be necessary to improve both the quality of the programme and the ability of participants to foster change on the basis of what they have learnt. This provides challenges for both the programme organizers and the providers of maternal and child health services in Mongolia. IMPLICATIONS FOR NURSING AND/OR HEALTH POLICY The success of the distance education programme suggests that collaborations of this type are a cost-effective method of disseminating best practice in policy and practice to improve the quality of care provided to mothers and children in low-resource settings.	

		CONCLUSIONS A distance education programme is vital to link maternal care providers in Mongolia to new trends in care. Mongolia's relative isolation means that this programme is particularly valuable there. However, the programme could work equally well in other developing country settings.	
20	Interprofessional education telephone simulation for campus-based pharmacy students and distance-learning family nurse practitioner students. March 2019 Currents in pharmacy teaching and learning	BACKGROUND Interprofessional education (IPE) is an essential component of healthcare professions' curriculum but is often difficult to provide due to scheduling issues, cost, different learning formats, and lack of access to other health care professions. To meet the school of pharmacy's need to have IPE with prescribers and the school of nursing's need to provide IPE to distance-learning students, a telephone-based IPE activity was created. The goals of the simulation activity were to provide students a forum to practice communication skills, work to maintain a climate of mutual respect, and forge interdependent relationships with another profession. INTERPROFESSIONAL ACTIVITY Each student in a team completed a survey rating the other professional students and qualitative data was collected. Individual care plans were evaluated for appropriateness of therapy, monitoring, and follow-up recommendations. Achievement of the effective communication outcome was evaluated through student survey data, qualitative comments, and concordance of care plans among team members. Concordance was determined based on whether the team was in complete agreement. DISCUSSION Qualitative data revealed the goals of mutual respect and interdependent relationships between professions were achieved. The majority of students agreed that effective communication was achieved; however, discordance of the patient care plans between team members suggested ineffective communication. IMPLICATIONS The simulation activity met IPE accreditation needs of both pharmacy and nursing profession in a creative method to address barriers of location, cost, scheduling, and lack of access to other healthcare professions.	
21	Virtual Learning Environment in Continuing Education for Nursing in Oncology: an Experimental Study. December 2016	Nurses working in oncology require continuing education and nowadays distance education is a possibility. To compare learning outcomes of the professionals participating in classroom learning versus distance learning; describing the sociodemographic characteristics and digital fluency of participants; comparing learning outcomes with independent variables; assessing the adequacy of educational practices in Virtual Environment Moodle Learning through the constructivist online learning environment survey. An experimental, randomized	Link (Athens log in required)

	Journal of Cancer Education	controlled study; conducted at the A C Camargo Cancer Center, located in São Paulo, SP, Brazil. The study included 97 nurses, with average training of 1 to 2 years. A control group (n = 44) had face to face training and the experiment group (n = 53) had training by distance learning, both with identical program content. The dependent variable was the result of learning, measured by applying a pre-assessment questionnaire and post-intervention for both groups. The sociodemographic and digital fluency data were uniform among the groups. The performance of both groups was statistically significant (p 0.005), and the control group had a greater advantage (40.4 %). Distance education has proven to be an effective alternative for training nurses, especially when they have more complex knowledge, more experience in the area and institutional time. Distance Education may be a possibility for the training of nurses for work in oncology. The association of age, training time and the institution, and the experience in Oncology interfered in the performance of both groups.	
22	Incorporating medication administration safety in undergraduate nursing education: A literature review. January 2019 Nurse Education Today	OBJECTIVE The purpose of this review was to identify methods for incorporating medication administration safety in undergraduate nursing education. DESIGN The Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines directed this review. DATA SOURCES A search of four electronic databases (Cumulative Index to Nursing and Allied Health Literature, Education Resources Information Center, Google Scholar, and MedLine/PubMed MedLine/PubMed) as well as hand searches were conducted to identify original research published between 2005 and 2018.REVIEW METHODS Original empirical research describing a method for incorporating medication administration safety concepts in nursing education and examining its effectiveness on undergraduate nursing students' outcomes were selected for review. Articles describing medication safety education for graduate students, students other than those in nursing, and practicing nurses were excluded. RESULTS Twelve original research articles were included for review. Three methods for incorporating medication administration safety in undergraduate nursing education were identified: simulation experiences, technology aids, and online learning modules. Most studies were conducted in North America. The use of different interventions as well as different outcome measures was noted as a limitation to the collective body of research in this area. Also, there was a lack of information regarding psychometric properties of instruments used among the studies reviewed.	

		CONCLUSION Simulation experiences, use of technology aids, and online learning modules helped increase medication safety competence of nursing students. However, simulation equipment, select technology aids, and online learning may not be available for all nursing programs; therefore, educators should consider developing and testing classroom-based educational interventions. Moreover, future researchers should use or develop psychometrically sound instruments to measure nursing students' outcomes including competencies about medication administration safety.	
23	Innovative strategies: Increased engagement and synthesis in online advanced practice nursing education. May 2019 Nurse Education Today	INTRODUCTION The struggle to maintain quality education in the online environment has brought about the redesign for the family nurse practitioner courses. BACKGROUND The family nurse practitioner program uses graduate Health Education Systems Incorporated examination as a quality indicator and program benchmark. A downward trend in Health Education Systems Incorporated examination scores stimulated a need for change. Two strategies were implemented to enhance engagement and improve synthesis of clinical information. Case-based learning and gamification involves the use of game thinking and game mechanics in non-game contexts to engage users in solving problems while the case-based discussions act as formative assessment tool, providing information on student's progress and development. OBJECTIVES To assess the implementation of innovative strategies on the Health Education Systems Incorporated examination scores and to enhance students engagement and synthesis of clinical information. METHOD Case presentations were created in the Learning Management System an online program, for every module. Interwoven throughout the module are various game elements. The game elements include voluntary participation with immediate feedback that can be both positive and negative and provides a social connection. The student has the freedom to fail and the freedom to choose without significant repercussions. RESULTS The results showed examination scores increased significantly. Using a one-way analysis of variance to compare Health Education Systems Incorporated examination scores between semester cohorts of students, followed by a post hoc pairwise comparison a statistically significant difference ($p < .001$) between previous semesters was identified. CONCLUSION Although there are many approaches for online learning, using case presentations can mirror different social and cultural situations to challenge	

		the learner. Case-based discussion and gamification strategies are effective in engaging students in a challenging environment. Student responded positively to case-base presentation with game elements. Using this approach is designed to challenge and add value to the learning experience.	
24	Evaluating the Effectiveness of Two Teaching Strategies to Improve Nursing Students' Knowledge, Skills, and Attitudes About Quality Improvement and Patient Safety. October 2016 Nurse Education Perspectives	The purpose of this study was to evaluate two teaching strategies with regard to quality and safety education for nurses content on quality improvement and safety. Two groups (total of 64 students) participated in online learning or online learning in conjunction with a flipped classroom. A pretest/posttest control group design was used. The use of online modules in conjunction with the flipped classroom had a greater effect on increasing nursing students' knowledge of quality improvement than the use of online modules only. There was no statistically significant difference between the groups for safety.	Link (Athens log in required)
25	E-learning and nursing assessment skills and knowledge - An integrative review July 2018 Nurse Education Today	OBJECTIVES This review examines the current evidence on the effectiveness of digital technologies or e-based learning for enhancing the skills and knowledge of nursing students in nursing assessment. DESIGN & BACKGROUND This integrative review identifies themes emerging from e-learning and 'nursing assessment' literature. Literature reviews have been undertaken in relation to digital learning and nursing education, including clinical skills, clinical case studies and the nurse-educator role. Whilst perceptions of digital learning are well covered, a gap in knowledge persists for understanding the effectiveness of e-learning on nursing assessment skills and knowledge. This is important as comprehensive assessment skills and knowledge are a key competency for newly qualified nurses. DATA-SOURCES The MEDLINE, CINAHL, Cochrane Library and ProQuest Nursing and Allied Health Source electronic databases were searched for the period 2006 to 2016. Hand searching in bibliographies was also undertaken. REVIEW METHODS Selection criteria for this review included: FINDINGS: Twenty articles met the selection criteria for this review, and five major themes for e-based learning were identified (a) students become self-evaluators; (b)	

		blend and scaffold learning; (c) measurement of clinical reasoning; (d) mobile technology and Facebook are effective; and (e) training and preparation is vital. CONCLUSIONS Although e-based learning programs provide a flexible teaching method, evidence suggests e-based learning alone does not exceed face-to-face patient simulation. This is particularly the case where nursing assessment learning is not scaffolded. This review demonstrates that e-based learning and traditional teaching methods used in conjunction with each other create a superior learning style.	
26	Development of Online Learning Modules as an Adjunct to Skills Fairs and Lectures to Maintain Nurses' Competency and Comfort Level When Caring for Pediatric Patients Requiring Continuous Renal Replacement Therapy (CRRT). 2016 Nephrology Nursing Journal	Continuous renal replacement therapy (CRRT) for pediatric patients is an extremely specialized therapy requiring knowledge of the patient's diagnosis, understanding of the principles of the therapy, astute patient assessment, and proficiency with complicated equipment. The complexity of CRRT is compounded by its relatively rare occurrence, in the pediatric population. Maintaining staff competency with this high-risk/low-volume therapy is extremely difficult. This article discusses the development and implementation of a structured system and set of resources to support routine education, and the development of two online, interactive learning modules to provide additional exposure to GRRT throughout the year. The modules are an efficient, effective, and inexpensive way to provide additional education and information to large groups of staff.	Link (Athens log in required)
27	Health care professionals from developing countries report educational benefits after an online diabetes course May 2017 BMC Medical Education	BACKGROUND Medical education is a cornerstone in the global combat against diseases such as diabetes and obesity which together affect more than 500 million humans. Massive Open Online Courses (MOOCs) are educational tools for institutions to teach and share their research worldwide. Currently, millions of people have participated in evidence-based MOOCs, however educational and professional benefit(s) for course participants of such initiatives have not been addressed sufficiently. We therefore investigated if participation in a 6 week open online course in the prevention and treatment of diabetes and obesity had any impact on the knowledge, skills, and career of health care professionals contrasting participants from developing countries versus developed countries. METHODS 52.006 participants signed up and 29.469 participants were active in one of the three sessions (2014-2015) of Diabetes - a Global Challenge. Using an online based questionnaire (nine sections) software (Survey Monkey), email invitations were send out using a Coursera based database to the 29.469 course	Link

		participants. Responses were analyzed and stratified, according to the United Nations stratification method, by developing and developed countries. RESULTS 1.303 (4.4%) of the 29.469 completed the questionnaire. 845 of the 1303 were defined as health care professionals, including medical doctors (34%), researchers (15%), nurses (11%) and medical students (8%). Over 80% of the health care participants report educational benefits, improved knowledge about the prevention and treatment therapies of diabetes and furthermore improved professional life and practice. Over 40% reported that their professional network expanded after course participation. Study participants who did not complete all modules of the course reported similar impact as the ones that completed the entire course(P = 0.9). Participants from developing countries gained more impact on their clinical practice (94%) compared to health care professionals from developed regions (88%) (Mean of differences = 6%, P = 0.03. CONCLUSIONS Based on self-reports from course participants, MOOC based medical education seems promising with respect to providing accessible and free research-based education to health professionals in both developing and developed countries. Course participants from developing countries report more benefits from course participation than their counterparts in the developed world.	
28	Effect of an interactive E-learning tool for delirium on patient and nursing outcomes in a geriatric hospital setting: findings of a before-after study. January 2018 BMC Geriatrics	BACKGROUND Education of healthcare workers is a core element of multicomponent delirium strategies to improve delirium care and, consequently, patient outcomes. However, traditional educational strategies are notoriously difficult to implement. E-learning is hypothesised to be easier and more cost effective, but research evaluating effectiveness of delirium education through e-learning is scarce at present. Aim is to determine the effect of a nursing e-learning tool for delirium on: (1) in-hospital prevalence, duration and severity of delirium or mortality in hospitalized geriatric patients, and (2) geriatric nurses' knowledge and recognition regarding delirium. METHODS A before-after study in a sample of patients enrolled pre-intervention (non-intervention cohort (NIC); n = 81) and post-intervention (intervention cohort (IC); n = 79), and nurses (n = 17) of a geriatric ward (university hospital). The intervention included an information session about using the e-learning tool, which consisted of 11 e-modules incorporating development of knowledge and skills in the prevention, detection and management of delirium, and the completion of a delirium e-learning tool during a three-month period. Key patient outcomes included in-hospital prevalence and duration of delirium (Confusion Assessment Method), delirium severity (Delirium Index) and mortality (in-	Link

		hospital; 12 months post-admission); key nurse outcomes included delirium knowledge (Delirium Knowledge Questionnaire) and recognition (Case vignettes). Logistic regression and linear mixed models were used to analyse patient data; Wilcoxon Signed Rank tests, McNemar's or paired t-tests for nursing data. RESULTS No significant difference was found between the IC and NIC for in-hospital prevalence (21.5% versus 25.9%; p = 0.51) and duration of delirium (mean 4.2 ± SD 4.8 days versus 4.9 ± SD 4.8 days; p = 0.38). A trend towards a statistically significant lower delirium severity (IC versus NIC: difference estimate - 1.59; p = 0.08) was noted for delirious IC patients in a linear mixed model. No effect on patient mortality and on nurses' delirium knowledge (p = 0.43) and recognition (p = 1.0) was found. CONCLUSION Our study, the first in its area to investigate effects of delirium e-learning on patient outcomes, demonstrated no benefits on both geriatric patients and nurses. Further research is needed to determine whether delirium e-learning nested within a larger educational approach inclusive of enabling and reinforcing strategies, would be effective.TRIAL REGISTRATIONISRCTN (82,293,702 , 27/06/2017).	
29	Effectiveness of asthma principles and practice course in increasing nurse practitioner knowledge and confidence in the use of asthma clinical guidelines. April 2015 Journal of the American Association of Nurse Practitioners	PURPOSE The Asthma Principle and Practice (APP) course, an evidence-based blended distance-learning educational encounter, was designed to aid in the dissemination of the 2007 asthma clinical guidelines (EPR-3) and priority messages, increase knowledge of content of the guidelines as well as create an environment to enable participants to apply knowledge and skills into clinical practice. Students received a self-study binder 6-week period prior to attendance at an interactive study day. The APP is grounded in adult education principle and practices. DATA SOURCESA questionnaire was completed before reading the study binder and post study day to measure demographic variables as well as awareness of and changes in knowledge and confidence in key attributes of the clinical guidelines including patient education. CONCLUSIONS The results showed that by taking the APP course confidence levels related to knowledge of asthma and its management increased with specific reference to the asthma clinical guidelines. Confidence in the use of patient education/communication strategies improved as well as the use of pulmonary function tests and the interpretation of test results.	

		IMPLICATIONS FOR PRACTICE Nurse practitioners are an important audience to target in the dissemination of clinical guidelines and benefit from educational materials based on adult education strategies.	
30	The utility and impact of information communication technology (ICT) for pre-registration nurse education: A narrative synthesis systematic review. January 2017 Nurse Education Today	OBJECTIVES To evaluate and summarise the utility and impact of information communication technology (ICT) in enhancing student performance and the learning environment in pre-registration nursing. DESIGN A systematic review of empirical research across a range of themes in ICT health-related education. DATA SOURCES Science Direct, Cinahl, AMED, MEDLINE, PubMed, ASSIA, OVID and OVID SP (2008-2014). Further date parameters were imposed by theme. REVIEW METHODS Evidence was reviewed by narrative synthesis, adopting Caldwell's appraisal framework and CASP for qualitative methods. Selection and inclusion was grounded in the PICOS structure, with language requirements (English), and further parameters were guided by theme appropriateness. RESULTS Fifty studies were selected for review across six domains: reusable learning objects, media, audience response systems, e-portfolios, computer-based assessment and faculty adoption of e-learning. Educational ICT was found to be non-inferior to traditional teaching, while offering benefits to teaching and learning efficiency. Where support is in place, ICT improves the learning environment for staff and students, but human and environmental barriers need to be addressed. CONCLUSION This review illuminates more advantages for ICT in nurse training than previously. The key advantage of flexibility is supported, though with little evidence for effect on depth of learning.	
31	E-Mentoring for Doctor of Nursing Practice Students: A Pilot Program. August 2016 The Journal of Nursing Education	BACKGROUND The growing number of online Doctor of Nursing Practice (DNP) programs, steady attrition rates, and shortage of faculty created an opportunity to explore the use of distance-mediated mentoring. METHOD Twenty first-year DNP Nursing Leadership students were matched with DNP-prepared mentors in a formalized e-mentoring program. The Ideal Mentor Scale was used to determine what students desired most from the mentoring relationship in addition to midpoint and end-of-program surveys. RESULTS Quantitative analysis revealed mentors and mentees found the relationship to be beneficial ($p < .05$). Mentees (89%) and mentors (92%) noted	Link (Athens log in required)

		the program supplied adequate resources, and the majority of students would recommend the program. CONCLUSION Having a mentor leads to both mentor- and mentee-perceived benefits. Recommendations include continuing to seek ways to improve the communication and commitment between the mentor and mentee in order to receive reciprocal program benefits. [J Nurs Educ. 2016;55(8):458-462.].	
32	Using Debates to Teach Evidence-Based Practice in Large Online Courses. October 2015 The Journal of Nursing Education	BACKGROUND To engage in evidence-based practice (EBP), baccalaureate nursing graduates' competencies must include locating, interpreting, appraising, and applying research findings. Faculty are challenged to find effective ways to incorporate this content in large online courses. METHOD Faculty in a thriving college of nursing used interactive debates to teach EBP skills in a large (200+ students) online undergraduate course. RESULTS Students remain highly engaged while practicing critical thinking, team-work, leadership, delegation, communication skills, and peer evaluation through participation in a series of faculty-facilitated online debates. CONCLUSION Meticulous course organization and use of structured debates allows one instructor to teach skills for EBP, while keeping students engaged with each other, the instructor, and the material. Use of debates and the amount of engagement among students and faculty achieved could not be accomplished in a large face-to-face course.	Link (Athens log in required)
Systematic Reviews (mixture of healthcare professionals)			
33	Effectiveness of distance learning strategies for continuing professional development (CPD) for rural allied health practitioners: a systematic review. July 2017 BMC Medical Education	BACKGROUND Allied health professionals working in rural areas face unique challenges, often with limited access to resources. Accessing continuing professional development is one of those challenges and is related to retention of workforce. Effectiveness of distance learning strategies for continuing professional development in rural allied healthcare workers has not been evaluated. METHODS We searched 17 databases and the grey literature up to September 2016 following the PRISMA guidelines. Any primary studies were included that focussed on allied health and distance delivery regardless of education topic or study design. Two independent reviewers extracted data and critically appraised the selected studies. RESULTS The search returned 5257 results. With removal of duplicate references, we reviewed 3964 article titles and abstracts; n = 206 appeared potentially eligible and were scrutinised via full text screening; n = 14 were	Link

		included. Studies were published between 1997 and 2016, were of varied methodological quality and were predominantly from Australia, USA and Canada with a focus on satisfaction of learners with the delivery method or on measures of educational outcomes. Technologies used to deliver distance education included video conference, teleconference, web based platforms and virtual reality. Early papers tended to focus more on the technology characteristics than educational outcomes. Some studies compared technology based delivery to face to face modes and found satisfaction and learning outcomes to be on par. Only three studies reported on practice change following the educational intervention and, despite a suggestion there is a link between the constructs, none measured the relationship between access to continuing professional development and workforce retention. CONCLUSION Technology based options of delivery have a high utility, however the complex inter-relatedness of time, use, travel, location, costs, interactivity, learning outcomes and educational design suggest a need for more sophisticated consideration by educational providers.TRIAL REGISTRATIONRegistration with PROSPERO 30 June 2016: CRD42016041588 .	
34	Effectiveness of Telementoring in Surgery Compared With On-site Mentoring: A Systematic Review. August 2017 Surgical innovation	BACKGROUND Mentorship is important but may not be feasible for distance learning. To bridge this gap, telementoring has emerged. The purpose of this systematic review was to evaluate the effectiveness of telementoring compared with on-site mentoring. METHODS A search was done up to March 2015. Studies were included if they used telementoring between surgeons during a clinical encounter and if they compared on-site mentoring and telementoring. RESULTS A total of 11 studies were included. All reported no difference in complication rates, and 9 (82%) reported similar operative times; 4 (36%) reported technical issues, which was 3% of the total number of cases in the 11 studies. No study reported on higher levels of evidence for effectiveness of telementoring as an educational intervention. CONCLUSION Studies reported that telementoring is associated with similar complication rates and operative times compared with on-site mentoring. However, the level of evidence to support the effectiveness of telementoring as a training tool is limited. There is a need for studies that provide evidence for the equivalence of the effectiveness of telementoring as an educational intervention in comparison with on-site mentoring.	

35	Effectiveness of E-Learning in Oral Radiology Education: A Systematic Review. September 2016 Journal of Dental Education	E-learning has been used recently in dental curricula to support traditional learning methods. However, the published literature concerning e-learning in oral radiology has shown mixed conclusions. The aim of this systematic review was to provide a synthesis of the effectiveness of e-learning in oral radiology education when compared with traditional classroom learning methods. A search of the literature was conducted on the LILACS, PubMed, Science Direct, Scopus, and Web of Science databases. Trials registries were also consulted for ongoing trials, and a partial grey literature search was conducted. Controlled trials about oral radiology education that compared any e-learning method with a control group using any traditional classroom instruction method were included. E-learning effectiveness was measured using three outcomes from Kirkpatrick's model of evaluation: attitudes about e-learning, knowledge gain, and performance on clinical procedures. Data were analyzed descriptively. Qualitative appraisal was performed according to the Cochrane risk of bias tool for randomized trials and MINORS tool for non-randomized trials. Eleven studies met the inclusion criteria. Risk of bias was identified related to the selection procedures, blinding, lack of sample size calculation, and incomplete analyses. Ten studies reported that students had positive attitude when using e-learning. Results from the knowledge gain outcome were mixed. Only two studies examined performance on clinical procedures, showing contrasting results. The evidence reviewed in this study suggests that e-learning in oral radiology is at least as effective as traditional learning methods and that students have positive attitudes about e-learning.	
36	Systematic review of e-learning for surgical training. October 2016 The British Journal of Surgery	BACKGROUND Internet and software-based platforms (e-learning) have gained popularity as teaching tools in medical education. Despite widespread use, there is limited evidence to support their effectiveness for surgical training. This study sought to evaluate the effectiveness of e-learning as a teaching tool compared with no intervention and other methods of surgical training. METHODSA systematic literature search of bibliographical databases was performed up to August 2015. Studies were included if they were RCTs assessing the effectiveness of an e-learning platform for teaching any surgical skill, compared with no intervention or another method of training. RESULTS From 4704 studies screened, 87 were included with 7871 participants enrolled, comprising medical students (52 studies), trainees (51 studies), qualified surgeons (2 studies) and nurses (6 studies). E-learning tools were used	

		for teaching cognitive (71 studies), psychomotor (36 studies) and non-technical (8 studies) skills. Tool features included multimedia (84 studies), interactive learning (60 studies), feedback (27 studies), assessment (26 studies), virtual patients (22 studies), virtual reality environment (11 studies), spaced education (7 studies), community discussions (2 studies) and gaming (2 studies). Overall, e-learning showed either greater or similar effectiveness compared with both no intervention (29 and 4 studies respectively) and non-e-learning interventions (29 and 22 studies respectively). CONCLUSION Despite significant heterogeneity amongst platforms, e-learning is at least as effective as other methods of training.	
37	E-learning for health professionals. January 2018 The Cochrane Database of Systematic Reviews	BACKGROUND The use of e-learning, defined as any educational intervention mediated electronically via the Internet, has steadily increased among health professionals worldwide. Several studies have attempted to measure the effects of e-learning in medical practice, which has often been associated with large positive effects when compared to no intervention and with small positive effects when compared with traditional learning (without access to e-learning). However, results are not conclusive. OBJECTIVES To assess the effects of e-learning programmes versus traditional learning in licensed health professionals for improving patient outcomes or health professionals' behaviours, skills and knowledge. SEARCH METHODS We searched CENTRAL, MEDLINE, Embase, five other databases and three trial registers up to July 2016, without any restrictions based on language or status of publication. We examined the reference lists of the included studies and other relevant reviews. If necessary, we contacted the study authors to collect additional information on studies. SELECTION CRITERIA Randomised trials assessing the effectiveness of e-learning versus traditional learning for health professionals. We excluded non-randomised trials and trials involving undergraduate health professionals. DATA COLLECTION AND ANALYSIS Two authors independently selected studies, extracted data and assessed risk of bias. We graded the certainty of evidence for each outcome using the GRADE approach and standardised the outcome effects using relative risks (risk ratio (RR) or odds ratio (OR)) or standardised mean difference (SMD) when possible. MAIN RESULTS We included 16 randomised trials involving 5679 licensed health professionals (4759 mixed health professionals, 587 nurses, 300 doctors and 33 childcare health consultants).When compared with traditional learning at	Link

		12-month follow-up, low-certainty evidence suggests that e-learning may make little or no difference for the following patient outcomes: the proportion of patients with low-density lipoprotein (LDL) cholesterol of less than 100 mg/dL (adjusted difference 4.0%, 95% confidence interval (CI) -0.3 to 7.9, N = 6399 patients, 1 study) and the proportion with glycated haemoglobin level of less than 8% (adjusted difference 4.6%, 95% CI -1.5 to 9.8, 3114 patients, 1 study). At 3- to 12-month follow-up, low-certainty evidence indicates that e-learning may make little or no difference on the following behaviours in health professionals: screening for dyslipidaemia (OR 0.90, 95% CI 0.77 to 1.06, 6027 patients, 2 studies) and treatment for dyslipidaemia (OR 1.15, 95% CI 0.89 to 1.48, 5491 patients, 2 studies). It is uncertain whether e-learning improves or reduces health professionals' skills (2912 health professionals; 6 studies; very low-certainty evidence), and it may make little or no difference in health professionals' knowledge (3236 participants; 11 studies; low-certainty evidence).Due to the paucity of studies and data, we were unable to explore differences in effects across different subgroups. Owing to poor reporting, we were unable to collect sufficient information to complete a meaningful 'Risk of bias' assessment for most of the quality criteria. We evaluated the risk of bias as unclear for most studies, but we classified the largest trial as being at low risk of bias. Missing data represented a potential source of bias in several studies. AUTHORS' CONCLUSIONS When compared to traditional learning, e-learning may make little or no difference in patient outcomes or health professionals' behaviours, skills or knowledge. Even if e-learning could be more successful than traditional learning in particular medical education settings, general claims of it as inherently more effective than traditional learning may be misleading.	
38	e-Learning in Surgical Education: A Systematic Review. 2015 Journal of Surgical Education	OBJECTIVE e-Learning involves the delivery of educational content through web-based methods. Owing to work-hour restrictions and changing practice patterns in surgery, e-learning can offer an effective alternative to traditional teaching. Our aims were to (1) identify current modalities of e-learning, (2) assess the efficacy of e-learning as an intervention in surgical education through a systematic review of the literature, and (3) discuss the relevance of e-learning as an educational tool in surgical education. This is the first such systematic review in this field. DESIGN A systematic search of MEDLINE and EMBASE was conducted for relevant articles published until July 2014, using a predefined search strategy.	

		The database search was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. RESULTS A total of 38 articles were found which met the inclusion criteria. In these studies, e-learning was used as an intervention in 3 different ways: (1) to teach cases through virtual patients (18/38); (2) to teach theoretical knowledge through online tutorials, or other means (18/38); and (3) to teach surgical skills (2/38). Nearly all of the studies reviewed report significant knowledge gain from e-learning; however, 2 in 3 studies did not use a control group. CONCLUSIONS e-Learning has emerged as an effective mode of teaching with particular relevance for surgical education today. Published studies have demonstrated the efficacy of this method; however, future work must involve well-designed randomized controlled trials comparing e-learning against standard teaching.	
39	The Effectiveness of Blended Learning in Health Professions: Systematic Review and Meta-Analysis. January 2016 Journal of Medical Internet Research	BACKGROUND Blended learning, defined as the combination of traditional face-to-face learning and asynchronous or synchronous e-learning, has grown rapidly and is now widely used in education. Concerns about the effectiveness of blended learning have led to an increasing number of studies on this topic. However, there has yet to be a quantitative synthesis evaluating the effectiveness of blended learning on knowledge acquisition in health professions. OBJECTIVE We aimed to assess the effectiveness of blended learning for health professional learners compared with no intervention and with nonblended learning. We also aimed to explore factors that could explain differences in learning effects across study designs, participants, country socioeconomic status, intervention durations, randomization, and quality score for each of these questions. METHODS We conducted a search of citations in Medline, CINAHL, Science Direct, Ovid Embase, Web of Science, CENTRAL, and ERIC through September 2014. Studies in any language that compared blended learning with no intervention or nonblended learning among health professional learners and assessed knowledge acquisition were included. Two reviewers independently evaluated study quality and abstracted information including characteristics of learners and intervention (study design, exercises, interactivity, peer discussion, and outcome assessment). RESULTS We identified 56 eligible articles. Heterogeneity across studies was large (I(2) ≥93.3) in all analyses. For studies comparing knowledge gained from	Link

		blended learning versus no intervention, the pooled effect size was 1.40 (95% CI 1.04-1.77; P<.001; n=20 interventions) with no significant publication bias, and exclusion of any single study did not change the overall result. For studies comparing blended learning with nonblended learning (pure e-learning or pure traditional face-to-face learning), the pooled effect size was 0.81 (95% CI 0.57-1.05; P<.001; n=56 interventions), and exclusion of any single study did not change the overall result. Although significant publication bias was found, the trim and fill method showed that the effect size changed to 0.26 (95% CI -0.01 to 0.54) after adjustment. In the subgroup analyses, pre-posttest study design, presence of exercises, and objective outcome assessment yielded larger effect sizes. CONCLUSIONS Blended learning appears to have a consistent positive effect in comparison with no intervention, and to be more effective than or at least as effective as nonblended instruction for knowledge acquisition in health professions. Due to the large heterogeneity, the conclusion should be treated with caution.	
40	Effectiveness of teaching evidence-based medicine to undergraduate medical students: a BEME systematic review. January 2015 Medical Teacher	BACKGROUND Despite the widespread teaching of evidence-based medicine (EBM) to medical students, the relevant literature has not been synthesized appropriately as to its value and effectiveness. AIM To systematically review the literature regarding the impact of teaching EBM to medical students on their EBM knowledge, attitudes, skills and behaviors. METHODS MEDLINE, SCOPUS, Web of science, ERIC, CINAHL and Current Controlled Trials up to May 2011 were searched; backward and forward reference checking of included and relevant studies was also carried out. Two investigators independently extracted data and assessed the quality of the studies. RESULTS 10,111 potential studies were initially found, of which 27 were included in the review. Six studies examined the effect of clinically integrated methods, of which five had a low quality and the other one used no validated assessment tool. Twelve studies evaluated the effects of seminars, workshops and short courses, of which 11 had a low quality and the other one lacked a validated assessment tool. Six studies examined e-learning, of which five having a high or acceptable quality reported e-learning to be as effective as traditional teaching in improving knowledge, attitudes and skills. One robust study found problem-based learning less effective compared to usual teaching. Two studies	

		with high or moderate quality linked multicomponent interventions to improved knowledge and attitudes. No included study assessed the long-term effects of the teaching of EBM. CONCLUSIONS Our findings indicated that some EBM teaching strategies have the potential to improve knowledge, attitudes and skills in undergraduate medical students, but the evidenced base does not demonstrate superiority of one method. There is no evidence demonstrating transfer to clinical practice.	
41	Systematic Review: Blended learning is most effective in increasing evidence-based health care competencies of health workers 2017 Campbell Collaboration	This Campbell systematic review examines the effectiveness of e-learning in improving evidence-based health care knowledge and practice. **What are the main results in this review?** Compared to no learning, pure e-learning improves EBHC knowledge and skills but not attitudes and behaviour. Pure e-learning is no better than face-to-face learning in improving any of the primary outcomes. Blended learning is better than no learning for improving EBHC knowledge, skills, attitude and behaviour; and is better than face-to-face learning in improving attitudes and behaviour. Compared to pure e-learning, blended learning improves EBHC knowledge. It is not clear which e-learning components are most effective in improving outcomes. However, the included studies were of moderate to low quality, with a small number of studies included in each analysis, and imprecision and inconsistency of results in all comparisons. These shortcomings need to be taken into consideration when interpreting the results. **What do the findings in this review mean?** E-learning of EBHC, whether pure or blended, compared to no learning, improves EBHC knowledge and skills. There is no difference in these outcomes when comparing e-learning to face-to-face learning. Blended learning, which typically comprises multiple interventions, appears more effective than other types of learning in improving EBHC knowledge, skills, attitude and behaviour. Future research should focus on the different components of e-learning and should adequately report on all the intervention components, the educational context and implementation strategies.	Link
42	Online eLearning for undergraduates in health professions: a systematic review of the impact on	**Background** Health systems worldwide are facing shortages in health professional workforce. Several studies have demonstrated the direct correlation between the availability of health workers, coverage of health services, and population health outcomes. To address this shortage, online eLearning is increasingly being adopted in health professionals' education. To inform policy–making, in online eLearning, we need to determine its effectiveness.	Link

	knowledge, skills, attitudes and satisfaction June 2014 Journal of Global Health	**Methods** We performed a systematic review of the effectiveness of online eLearning through a comprehensive search of the major databases for randomised controlled trials that compared online eLearning to traditional learning or alternative learning methods. The search period was from January 2000 to August 2013. We included articles which primarily focused on students' knowledge, skills, satisfaction and attitudes toward eLearning and cost-effectiveness and adverse effects as secondary outcomes. Two reviewers independently extracted data from the included studies. Due to significant heterogeneity among the included studies, we presented our results as a narrative synthesis. **Findings** Fifty–nine studies, including 6750 students enrolled in medicine, dentistry, nursing, physical therapy and pharmacy studies, met the inclusion criteria. Twelve of the 50 studies testing knowledge gains found significantly higher gains in the online eLearning intervention groups compared to traditional learning, whereas 27 did not detect significant differences or found mixed results. Eleven studies did not test for differences. Six studies detected significantly higher skill gains in the online eLearning intervention groups, whilst 3 other studies testing skill gains did not detect differences between groups and 1 study showed mixed results. Twelve studies tested students' attitudes, of which 8 studies showed no differences in attitudes or preferences for online eLearning. Students' satisfaction was measured in 29 studies, 4 studies showed higher satisfaction for online eLearning and 20 studies showed no difference in satisfaction between online eLearning and traditional learning. Risk of bias was high for several of the included studies. **Conclusion** The current evidence base suggests that online eLearning is equivalent, possibly superior to traditional learning. These findings present a potential incentive for policy makers to cautiously encourage its adoption, while respecting the heterogeneity among the studies.	
43	Mobile digital education for health professions: systematic review and meta-analysis by the Digital health Education Collaboration February 2019 Journal of Medical Internet Research	Background: There is a pressing need to implement efficient and cost-effective training to address the worldwide shortage of health professionals. Mobile digital education (mLearning) has been mooted as a potential solution to increase the delivery of health professions education as it offers the opportunity for wide access at low cost and flexibility with the portability of mobile devices. To better inform policy making, we need to determine the effectiveness of mLearning. Objective: The primary objective of this review was to evaluate the effectiveness of mLearning interventions for delivering health professions education in terms of learners' knowledge, skills, attitudes, and satisfaction. Methods: We performed a systematic review of the effectiveness of mLearning in health professions education using standard Cochrane methodology. We searched 7 major bibliographic databases from January 1990 to August 2017 and included randomized controlled trials (RCTs) or cluster RCTs.	Link

		Results: A total of 29 studies, including 3175 learners, met the inclusion criteria. A total of 25 studies were RCTs and 4 were cluster RCTs. Interventions comprised tablet or smartphone apps, personal digital assistants, basic mobile phones, iPods, and Moving Picture Experts Group-1 audio layer 3 player devices to deliver learning content. A total of 20 studies assessed knowledge (n=2469) and compared mLearning or blended learning to traditional learning or another form of digital education. The pooled estimate of studies favored mLearning over traditional learning for knowledge (standardized mean difference [SMD]=0.43, 95% CI 0.05-0.80, N=11 studies, low-quality evidence). There was no difference between blended learning and traditional learning for knowledge (SMD=0.20, 95% CI –0.47 to 0.86, N=6 studies, low-quality evidence). A total of 14 studies assessed skills (n=1097) and compared mLearning or blended learning to traditional learning or another form of digital education. The pooled estimate of studies favored mLearning (SMD=1.12, 95% CI 0.56-1.69, N=5 studies, moderate quality evidence) and blended learning (SMD=1.06, 95% CI 0.09-2.03, N=7 studies, low-quality evidence) over traditional learning for skills. A total of 5 and 4 studies assessed attitudes (n=440) and satisfaction (n=327), respectively, with inconclusive findings reported for each outcome. The risk of bias was judged as high in 16 studies. Conclusions: The evidence base suggests that mLearning is as effective as traditional learning or possibly more so. Although acknowledging the heterogeneity among the studies, this synthesis provides encouraging early evidence to strengthen efforts aimed at expanding health professions education using mobile devices in order to help tackle the global shortage of health professionals.	
44	Systematic review on the effectiveness of augmented reality applications in medical training January 2016 Surgical Endoscopy	Background Computer-based applications are increasingly used to support the training of medical professionals. Augmented reality applications (ARAs) render an interactive virtual layer on top of reality. The use of ARAs is of real interest to medical education because they blend digital elements with the physical learning environment. This will result in new educational opportunities. The aim of this systematic review is to investigate to which extent augmented reality applications are currently used to validly support medical professionals training. Methods PubMed, Embase, INSPEC and PsychInfo were searched using predefined inclusion criteria for relevant articles up to August 2015. All study types were considered eligible. Articles concerning AR applications used to train or educate medical professionals were evaluated.	Link

		Results Twenty-seven studies were found relevant, describing a total of seven augmented reality applications. Applications were assigned to three different categories. The first category is directed toward laparoscopic surgical training, the second category toward mixed reality training of neurosurgical procedures and the third category toward training echocardiography. Statistical pooling of data could not be performed due to heterogeneity of study designs. Face-, construct- and concurrent validity was proven for two applications directed at laparoscopic training, face and construct validity for neurosurgical procedures and face-, content- and construct validity in chocardiography training. In the literature, none of the ARAs completed a full validation process for the purpose of use. Conclusion Augmented reality applications that support blended learning in medical training have gained public and mscientific interest. In order to be of value, applications must be able to transfer information to the user. Although promising, the literature to date is lacking to support such evidence.	
45	Effectiveness of distance learning strategies for continuing professional development (CPD) for rural allied health practitioners: a systematic review July 2017 BMC Medical Education	Background: Allied health professionals working in rural areas face unique challenges, often with limited access to resources. Accessing continuing professional development is one of those challenges and is related to retention of workforce. Effectiveness of distance learning strategies for continuing professional development in rural allied healthcare workers has not been evaluated. Methods: We searched 17 databases and the grey literature up to September 2016 following the PRISMA guidelines. Any primary studies were included that focussed on allied health and distance delivery regardless of education topic or study design. Two independent reviewers extracted data and critically appraised the selected studies. Results: The search returned 5257 results. With removal of duplicate references, we reviewed 3964 article titles and abstracts; *n* = 206 appeared potentially eligible and were scrutinised via full text screening; *n* = 14 were included. Studies were published between 1997 and 2016, were of varied methodological quality and were predominantly from Australia, USA and Canada with a focus on satisfaction of learners with the delivery method or on measures of educational outcomes. Technologies used to deliver distance education included video conference, teleconference, web based platforms and virtual reality. Early papers tended to focus more on the technology characteristics than educational outcomes. Some studies compared technology based delivery to face to face modes and found satisfaction and learning outcomes to be on par. Only three studies reported on practice change following the educational intervention and, despite a suggestion there is a link between the constructs, none measured the	Link

		relationship between access to continuing professional development and workforce retention. Conclusion: Technology based options of delivery have a high utility, however the complex inter-relatedness of time, use, travel, location, costs, interactivity, learning outcomes and educational design suggest a need for more sophisticated consideration by educational providers.	

Search strategies

"digital learning" AND benefits (15/4/19)
"online learning" AND benefits (15/4/19)
"flexible learning" AND benefits (15/4/19)
"blended learning" AND benefits (15/4/19)
"online learning" AND effectiveness (15/4/19)
"digital learning" AND effectiveness (15/4/19)
"flexible learning" AND effectiveness (15/4/19)
"blended learning" AND effectiveness (15/4/19)

Of interest

Scoping study on the emerging use of Artificial Intelligence (AI) and robotics in social care
May 2018

The purpose of the scoping study is to:

- Examine the existing international literature in the context of AI and robotics and their uses in adult social care;
- Explore what is currently happening in the context of AI and robotics and their uses in adult social care focusing on the UK but including international examples; and
- Outline workforce issues that might arise as the use of AI and robotics in adult social care begins to grow.

See section on "evidence of effectiveness"

4.23 The evidence base demonstrating the effectiveness of AI and robotics in supporting care provision is relatively under-developed and characterised by research that is limited due to methodological issues. This is in part due to the fact that many of the AI and robotic technologies have yet to move from concept and early prototype stage to wider application within the adult social care sector. Much of the evidence base therefore presents commentary on the future potential for the use of AI and robotics within social care whilst highlighting a need for more in-depth studies.

4.24 Bouwhuis at el (2016) report on the current use and possibilities of robots in care and propose that assistive social robots can be useful in eldercare for two reasons, a functional one and an affective one. The authors state that such robots are developed to function as an interface for the elderly with digital technology and to help increase quality of life by providing companionship.

4.25 Whilst the authors point to a growing attention for these devices in the research literature, they point out that no comprehensive review has yet been performed to investigate the effectiveness of such robots in the care of the elderly and that more work on methods is needed as well as robust, large-scale studies to establish the effects of these devices.
https://www.skillsforcare.org.uk/Documents/Topics/Digital-working/Robotics-and-AI-in-social-care-Final-report.pdf

A framework for evaluating the effectiveness and researching the impact of digital learning tools
Macmillan Learning
https://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=35&cad=rja&uact=8&ved=2ahUKEwjN4M-kztHhAhWURBUIHQf3CGc4HhAWMAR6BAgFEAI&url=https%3A%2F%2Fwww.macmillanlearning.com%2FCatalog%2FuploadedFiles%2FUnpacking_the_Black_Box_of_Efficacy.pdf&usg=AOvVaw3y2W0SQ-y4B75KOoN3Jxfx