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Educational interventions to improve literature searching skills in the health sciences: a scoping review

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APPENDIX C

Characteristics, interventions, outcomes, and main results of included studies

Reference	Country	Design	Setting	Participants	Number	Female/ male	Age (range, M)	Intervention group	Control group	Outcome measurement	Time of measurement	Main results
Sikora et al., 2019 [1]	Canada	Pre-post trial	University	Undergraduate or graduate health sciences or medical students	29	NI	NI	Scheduled individualized research consultations for students, performed by librarians	NA	Self-developed information literacy rubric for scoring of open- ended questions regarding the use of appropriate keywords and search strategies (0=insufficient, 1=acceptable, 2=superior), rated by the last author	Baseline (T0), post-intervention (T1)	Use of appropriate keywords T0: M=1, SD=0.66 T1: M=1.34, SD=0.72 (p>0.05) Use of appropriate search strategies T0: M=0.21, SD=0.41 T1: M=0.76, SD=0.79 (p=0.001)
Hobbs et al., 2015 [2]	USA	Pre-post trial	University	Senior undergraduate radiologic science students	17	NI	NI	Library instruction on planning literature searches, developing search strategies, searching health-related and medicine-related databases	NA	Questionnaire on knowledge and skills in information literacy developed by the health sciences librarian and the Radiologic Science Faculty (↑correctness), rating person(s) and rubric not described	Baseline (T0), post-intervention (T1)	Database search skills T0: Correct=29.4% T1: Correct=94.1% Developing search strategies T0: Correct=82.3% T1: Correct=100% Search concepts T0: Correct=94.1% T1: Correct=100% Database selection T0: Correct=17.6% T1: Correct=64.7%

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Qureshi et al., 2015 [3]	Pakistan	Pre-post trial	University	Postgraduate dental students	42	20/22	NI	Workshop comprised 3 sessions of lectures and hands-on practice	NA	Questions of the Fresno Test tool (where to find evidence, 0–6, excellent=6; able to search PubMed, 0–8, excellent=8), rating person(s) not described	Baseline (T0), post-intervention (T1)	Where to find evidence T0: M=1.2, SD=1.5 T1: M=2.0, SD=1.6 (p=0.002) Able to search PubMed T0: M=0.2, SD=0.8 T1: M=1.6, SD=2.4 (p=0.003)
Brettle and Raynor, 2013 [4]	UK	RCT	University	Undergraduate nursing students	55 (IG: 26; CG: 29)	NI	18–40, NI	Online in-house information literacy tutorial (session 1) and follow-up information skills session (face-to-face) after one month (session 2)	Face-to-face session, delivered by the nursing subject librarian (session 1) and follow-up information skills session	Test of skills to search for evidence via CINAHL concerning specific research questions using a rubric identifying key features in the search strategy (scoring of use of synonyms, any truncation, correct truncation, correct Boolean OR, correct Boolean AND [each 1 point], correct keywords [1 point for each up to 3], additional feature; e.g., limits, nesting [1 point for each up to 2], 0–10, ↑correctness), rated independently by 2 researchers, disagreements resolved through discussion	Baseline session 1 (T0), post-intervention session 1 (T1), Baseline session 2 (T2), post-intervention session 2 (T3)	IG T0: M=0.35, SD=0.88 T1: M=1.77, SD=2.24 T0 vs. T1: p=0.001 T3: M=1.25, SD=1.48 T4: M=3.06, SD=1.7 CG T1: M=2.23, SD=1.99 T0 vs. T1: p<0.001 T2: M=1.56, SD=1.54 T3: M=2.56, SD=1.86, SD=2.56 IG vs. CG T0: p=0.588 T1: p=0.263

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Carlock and Anderson, 2007 [5]	USA	CT	University	Undergraduate nursing students	90 (IG: 60; KG: 30)	84/6	9–52, 27	Librarian instruction including homework and in-class assignment	No intervention	Self-created rubric comparing the search history of a predefined search in CINAHL against the rubric measuring 5 criteria (subject heading search, selection of subject headings, use of subheadings, combining of terms, use of limits, 0–100%, ↑correctness), rating person(s) not described	Baseline (T0), post-intervention (T1)	IG T0: M=60.6% T1: M=88% CG T0: M=45% T1: M=47%
Grant and Brettle, 2006 [6]	UK	Pre-post trial	University	Postgraduate students in research in health and social care	13	NI	NI	Self-developed web-based MEDLINE tutorial by an information specialist and tutor	NA	Modified Rosenberg assessment tool comprised a skills checklist (e.g., Boolean operators, MeSH/indexing terms, application of limits, and whether a manageable and relevant number references were retrieved, 1–16, ↑correctness), rating person(s) not described	Baseline (T0), post-intervention (T1), post-intervention (T2, 10 weeks later)	T0: M=4.58, SD=1.5 T1: M=6.45, SD=1.46 T2: M=9.70, SD=3.53 (p=0.001) T0 vs. T1: p=0.04 T1 vs. T2: p=0.008
Gruppen, et al., 2005 [7]	USA	CT	University	Fourth-year medical students	92 (IG: 34; CG: 58)	NI	NI	Instructional intervention on EBM-based techniques for searching MEDLINE for evidence related to a clinical problem	No intervention	Structured clinical scenario (described in a publication) and scoring on literature search quality and search errors developed by librarians at the University of Michigan, based on a template designed by librarians at the University of Rochester (quality: score	Baseline (T0), post-intervention (T1, one month later)	Quality score (overall) IG T0: M=59.8, SD=25.5 T1: M=72.5, SD=21.3 MD: 12.7, SD: 23.9 CG T0: M=60, SD=21.2 T1: M=59.3, SD=16.9 MD: -0.7, SD=22.4

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								taught by medical librarians		max. 95, ↑quality; search errors: ↓correctness), rated by 2 librarians		IG vs. CG T0, MD: -0.2 (95 % CI: -11.3 to 10.9, $p \geq 0.05$) T1: MD: 13.2 (95 % CI: 4.1 to 22.3, $p < 0.05$) Search errors (total) IG: M=4.4, SD=3.3 CG: M=6.2, SD=2.8 MD: -1.8, 95 % CI: -0.4 to -3.2, $p < 0.05$
Rosenfeld et al., 2002 [8]	USA	Pre-post trial	Intensive care unit	Intensive care unit nurses	36	NI	20–>50, NI	Educational sessions complemented by a web-tutorial regarding information literacy competencies, performed by the medical librarian	NA	Self-defined, point-based competency rating scale (executing a search, proper use of subject headings, use of focusing [each 1 point], searching more than 1 database [3 points], using limits and Boolean operators [2 points], using keywords if no subject heading existed or in addition to subject headings [1 point], improper use of commands [minus 1 point], 0=no competency, 1–3=beginner, 4–6=intermediate, 7–9=advanced), each search rated by 2 medical librarians independently	Baseline (T0), post-intervention (T1)	T0 No competency: n=35 Intermediate: n=1 T1 No competency: n=21 Beginner: n=4 Intermediate: n=4 Advanced: n=3 Note: some of the data on searches were lost when the medical library server crashed.

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Vogel et al., 2002 [9]	USA	Pre-post trial	Hospital	Second-year medicine residents	42	26/16	30	Workshop on using Ovid's version of MEDLINE	NA	Participants completed the MEDLINE performance checklist (documentation of searching, relevance of retrieved citations [each 2 items], and searching strategies [6 items], each item rated as correct [fulfilled at least once per search] or incorrect), rated by the first author (assistant professor of medicine)	Baseline (T0), post-intervention (T1, directly after workshop), and post-intervention (T2, 1 to 11 months after workshop)	Significantly higher percentage of residents correctly used MEDLINE searching skills (p<0.05) Note: only p values available.
Wallace et al., 2000 [10]	Australia	CT	University	Undergraduate nursing, health, and behavioral sciences students	300 (IG: 100; CG: 200)	NI	NI	Curriculum-integrated information literacy program	No intervention	Objective test of library catalog skills regarding 5 domains (selecting suitable command, responding to command appropriately, selecting appropriate information source, locating journal article, using citation to locate article [1 point each domain], score 0–5, ↑skills), rating person(s) not described	Baseline (T0), post-intervention (T1)	IG T0, M: 1.85 T1, M: 3.41 CG T0, M: 1.85 T1, M: 2.36 Number of students who performed better, worse, or equal (matched results between baseline and post-intervention): Baseline>post-intervention: n=3 Baseline<post-intervention: n=51 Baseline=post-intervention: n=1

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Erickson and Warner, 1998 [11]	USA	RCT	Hospital	Residents in obstetrics and gynecology	31 (IG1: 11; IG2: 12; CG:8)	15/16	NI	IG1 Hands-on tutorial session on the use of MEDLINE by health sciences librarian with hands-on instruction No intervention	IG2 Tutorial on the use of MEDLINE at prescribed sessions performed by health sciences librarian	MEDLINE search recall and precision rates of 4 searches, rated by faculty members	Baseline (T0: searches 1+2), post-intervention (T1: searches 3+4)	Recall IG1 T0, M: 16% T1, M: 16% (no statistical significance) IG2 T0, M: 21% T1, M: 28% (no statistical significance) CG
Grant et al., 1996 [12]	USA	Pre-post trial	University	Pharmacy students	48	NI	NI	Lecture on systematic approach in combination with an online demonstration with Ovid to develop search strategies and homework assignments to perform a literature search	NA	Evaluation of 2 written search strategies (1 sensitive, 1 specific) concerning a predefined research question by pre-established scoring criteria (0–20, ↑correctness), rated by study authors (profession not described); different research question for each evaluation point	Baseline (T0), post-intervention (11 weeks later)	Creating sensitive search strategy T0: 8.2, SD=2.2 T1: M=19.1, SD=1.6 Creating specific search strategy T0: M=5.7, SD=3.3 T1: M=17.7, SD=3.3

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Haynes et al., 1993 [13]	Canada	RCT	Hospital	Physicians and physicians-in-training	264 (IG: 130; CG: 134)	NI	NI	Feedback on the first 10 searches and assignment by a clinical MEDLINE preceptor	No intervention	Participants performed 10 MEDLINE searches concerning individual research questions; the percentage of successful searches was defined if at least 1 relevant reference was retrieved (score 5–7 on 1–7 relevance scale, ↑relevance), evaluated for 1st, 4th, and 8th search, relevance rated by a clinician	Baseline (T0, after the first search), post-intervention (T1, after 4 searches), post-intervention (T2, after 8 searches)	IG T0: 65% T1: 71% T2: 80% CG T0: 65% T1: 75% T2: 72%
Bradigan and Mularski (1989) [14]	USA	Pre-post trial	University	Second-year medical students	9	NI	NI	Mini module courses performed by 2 librarian instructors	NA	Number of correct answers, 3 questions on the ability to extract important concepts in a statement of a medical problem to be searched online (5 questions on the use of Boolean/proximity operators, 1=correct answer, 0=incorrect answer, ↑correctness), rating person(s) not described	Baseline (T0), post-intervention (T1)	Ability to extract important concepts (total) T0: M: .88 T1: M: 3 Use of Boolean and proximity operators (total) T0: M=2.33 T1: M=4.77

Abbreviations: CT=Controlled trial; CG=Control group; CI=Confidence interval; EBM=Evidence-based medicine; IG=Intervention group; M=Mean; MD=Mean difference; MeSH=Medical Subject Headings; NA=Not applicable; NI=No information available; *p*=*p* value; OR=Odds ratio; RCT=Randomized controlled trial; SD=Standard deviation; SE=Standard error; T0=Baseline measurement; T1=Post-intervention measurement; vs=Versus.
Notes: ↑/↓=higher values indicate better outcomes; Underlined outcomes in case of multiple outcomes per study.

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