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Supplemental Digital Appendix 1

List of all included studies, sorted by year of publication, with full journal citation

1. Mancini ME, Kaye W. Measuring cardiopulmonary resuscitation performance: a comparison of the heartsaver checklist to manikin strip. *Resuscitation.* 1990;19:135-141.
2. Rubens AJ. Testing airway management skills: interactive video courseware vs ACLS instructor. *Respir Care.* 1991;36:849-856.
3. Berden HJ, Pijls NH, Willems FF, Hendrick JM, Crul JF. A scoring system for basic cardiac life support skills in training situations. *Resuscitation.* 1992;23:21-31.
4. Pippin DJ, Feil P. Interrater agreement on subgingival calculus detection following scaling. *J Dent Educ.* 1992;56:322-326.
5. Chapman DM, Marx JA, Honigman B, Rosen P, Cavanaugh SH. Emergency thoracotomy: comparison of medical student, resident, and faculty performances on written, computer, and animal-model assessments. *Acad Emerg Med.* 1994;1:373-381.
6. Chapman DM, Rhee KJ, Marx JA, Honigman B, Panacek EA, Martinez D, et al. Open thoracotomy procedural competency: validity study of teaching and assessment modalities. *Ann Emerg Med.* 1996;28:641-647.
7. Faulkner H, Regehr G, Martin J, Reznick R. Validation of an objective structured assessment of technical skill for surgical residents. *Acad Med.* 1996;71:1363-1365.
8. Nahigian E, Tutaska AM, Wieser MA. Making a CPR practice decision based on research. *J N Y State Nurses Assoc.* 1996;27:9-11.
9. Byrne AJ, Jones JG. Responses to simulated anaesthetic emergencies by anaesthetists with different durations of clinical experience. *Br J Anaesth.* 1997;78:553-556.
10. Devitt JH, Kurrek MM, Cohen MM, Fish K, Fish P, Murphy PM, et al. Testing the raters: inter-rater reliability of standardized anaesthesia simulator performance. *Can J Anaesth.* 1997;44:924-928.
11. Jansen JJ, Berden HJ, van der Vleuten CP, Grol RP, Rethans J, Verhoeff CP. Evaluation of cardiopulmonary resuscitation skills of general practitioners using different scoring methods. *Resuscitation.* 1997;34:35-41.
12. Martin JA, Regehr G, Reznick R, MacRae H, Murnaghan J, Hutchison C, et al. Objective structured assessment of technical skill (OSATS) for surgical residents. *Br J Surg.* 1997;84:273-278.
13. Reznick R, Regehr G, MacRae H, Martin J, McCulloch W. Testing technical skill via an innovative "bench station" examination. *Am J Surg.* 1997;173:226-230.
14. Chalabian J, Formenti S, Russell C, Pearce J, Dunnington G. Comprehensive needs assessment of clinical breast evaluation skills of primary care residents. *Ann Surg Oncol.* 1998;5:166-172.
15. Chung JY, Sackier JM. A method of objectively evaluating improvements in laparoscopic skills. *Surg Endosc.* 1998;12:1111-1116.
16. Derossis AM, Fried GM, Abrahamowicz M, Sigman HH, Barkun JS, Meakins JL. Development of a model for training and evaluation of laparoscopic skills. *Am J Surg.* 1998;175:482-487.
17. Devitt JH, Kurrek MM, Cohen MM, Fish K, Fish P, Noel AG, et al. Testing internal consistency and construct validity during evaluation of performance in a patient simulator. *Anesth Analg.* 1998;86:1160-1164.
18. Gaba DM, Howard SK, Flanagan B, Smith BE, Fish KJ, Botney R. Assessment of clinical performance during simulated crises using both technical and behavioral ratings. *Anesthesiology.* 1998;89:8-18.
19. Regehr G, MacRae H, Reznick RK, Szalay D. Comparing the psychometric properties of checklists and global rating scales for assessing performance on an OSCE-format examination. *Acad Med.* 1998;73:993-997.
20. Taffinder N, Sutton C, Fishwick RJ, McManus IC, Darzi A. Validation of virtual reality to teach and assess psychomotor skills in laparoscopic surgery: results from randomised controlled studies using the MIST VR laparoscopic simulator. *Stud Health Technol Inform.* 1998;50:124-130.
21. Fried GM, Derossis AM, Bothwell J, Sigman HH. Comparison of laparoscopic performance in vivo with performance measured in a laparoscopic simulator. *Surg Endosc.* 1999;13:1077-1081.
22. Macmillan AI, Cuschieri A. Assessment of innate ability and skills for endoscopic manipulations by the Advanced Dundee Endoscopic Psychomotor Tester: predictive and concurrent validity. *Am J Surg.* 1999;177:274-277.
23. McCarthy A, Harley P, Smallwood R. Virtual arthroscopy training: do the "virtual skills" developed match the real skills required? *Stud Health Technol Inform.* 1999;62:221-227.

- Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).
24. O'Toole RV, Playter RR, Krummel TM, Blank WC, Cornelius NH, Roberts WR, et al. Measuring and developing suturing technique with a virtual reality surgical simulator. *J Am Coll Surg.* 1999;189:114-127.
 25. Prystowsky JB, Regehr G, Rogers DA, Loan JP, Hiemenz LL, Smith KM. A virtual reality module for intravenous catheter placement. *Am J Surg.* 1999;177:171-175.
 26. Smith S, Wan A, Taffinder N, Read S, Emery R, Darzi A. Early experience and validation work with Procedicus VA--the Prosolia virtual reality shoulder arthroscopy trainer. *Stud Health Technol Inform.* 1999;62:337-343.
 27. Graham CA, Lewis NF. A scoring system for the assessment of basic life support ability. *Resuscitation.* 2000;43:111-114.
 28. Morgan PJ, Cleave-Hogg D. Evaluation of medical students' performance using the anaesthesia simulator. *Med Educ.* 2000;34:42-45.
 29. Richards C, Rosen J, Hannaford B, Pellegrini C, Sinanan M. Skill evaluation in minimally invasive surgery using force/torque signatures. *Surg Endosc.* 2000;14:791-798.
 30. Szalay D, MacRae H, Regehr G, Reznick R. Using operative outcome to assess technical skill. *Am J Surg.* 2000;180:234-237.
 31. Ault G, Reznick R, MacRae H, Leadbetter W, DaRosa D, Joehl R, et al. Exporting a technical skills evaluation technology to other sites. *Am J Surg.* 2001;182:254-256.
 32. Datta V, Mackay S, Mandalia M, Darzi A. The use of electromagnetic motion tracking analysis to objectively measure open surgical skill in the laboratory-based model. *J Am Coll Surg.* 2001;193:479-485.
 33. Devitt JH, Kurrek MM, Cohen MM, Cleave-Hogg D. The validity of performance assessments using simulation. *Anesthesiology.* 2001;95:36-42.
 34. Friedlich M, MacRae H, Oandasan I, Tannenbaum D, Batty H, Reznick R, et al. Structured assessment of minor surgical skills (SAMSS) for family medicine residents. *Acad Med.* 2001;76:1241-1246.
 35. Goff BA, Lentz GM, Lee D, Fenner D, Morris J, Mandel LS. Development of a bench station objective structured assessment of technical skills. *Obstet Gynecol.* 2001;98:412-416.
 36. Grantcharov TP, Rosenberg J, Pahle E, Funch-Jensen P. Virtual reality computer simulation. *Surg Endosc.* 2001;15:242-244.
 37. Haluck RS, Webster RW, Snyder AJ, Melkonian MG, Mohler BJ, Dise ML, et al. A virtual reality surgical trainer for navigation in laparoscopic surgery. *Stud Health Technol Inform.* 2001;81:171-176.
 38. Lentz GM, Mandel LS, Lee D, Gardella C, Melville J, Goff BA. Testing surgical skills of obstetric and gynecologic residents in a bench laboratory setting: validity and reliability. *Am J Obstet Gynecol.* 2001;184:1462-1468.
 39. McNatt SS, Smith CD. A computer-based laparoscopic skills assessment device differentiates experienced from novice laparoscopic surgeons. *Surg Endosc.* 2001;15:1085-1089.
 40. Morgan PJ, Cleave-Hogg D, Guest CB. A comparison of global ratings and checklist scores from an undergraduate assessment using an anesthesia simulator. *Acad Med.* 2001;76:1053-1055.
 41. Morgan PJ, Cleave-Hogg DM, Guest CB, Herold J. Validity and reliability of undergraduate performance assessments in an anesthesia simulator. *Can J Anaesth.* 2001;48:225-233.
 42. Ost D, DeRosiers A, Britt EJ, Fein AM, Lesser ML, Mehta AC. Assessment of a bronchoscopy simulator. *Am J Respir Crit Care Med.* 2001;164:2248-2255.
 43. Paisley AM, Baldwin PJ, Paterson-Brown S. Validity of surgical simulation for the assessment of operative skill. *Br J Surg.* 2001;88:1525-1532.
 44. Perkins GD, Hulme J, Tweed MJ. Variability in the assessment of advanced life support skills. *Resuscitation.* 2001;50:281-286.
 45. Pugh CM, Heinrichs WL, Dev P, Srivastava S, Krummel TM. Use of a mechanical simulator to assess pelvic examination skills. *Journal of the American Medical Association.* 2001;286:1021-1023.
 46. Rogers PL, Jacob H, Rashwan AS, Pinsky MR. Quantifying learning in medical students during a critical care medicine elective: a comparison of three evaluation instruments. *Crit Care Med.* 2001;29:1268-1273.
 47. Rosen J, Solazzo M, Hannaford B, Sinanan M. Objective laparoscopic skills assessments of surgical residents using Hidden Markov Models based on haptic information and tool/tissue interactions. *Stud Health Technol Inform.* 2001;81:417-423.
 48. Sherman KP, Ward JW, Wills DP, Sherman VJ, Mohsen AM. Surgical trainee assessment using a VE Knee Arthroscopy Training System (VE-KATS): experimental results. *Stud Health Technol Inform.* 2001;81:465-470.
 49. Smith CD, Farrell TM, McNatt SS, Metreveli RE. Assessing laparoscopic manipulative skills. *Am J Surg.* 2001;181:547-550.
 50. Tytherleigh MG, Bhatti TS, Watkins RM, Wilkins DC. The assessment of surgical skills and a simple knot-tying exercise. *Ann R Coll Surg Engl.* 2001;83:69-73.
 51. Ahlberg G, Heikkinen T, Iselius L, Leijonmarck C-E, Rutqvist J, Arvidsson D. Does training in a virtual reality simulator improve surgical performance? *Surg Endosc.* 2002;16:126-129.
 52. Cotin S, Stylopoulos N, Ottensmeyer M, Neumann P, Rattner D, Dawson S. Metrics for laparoscopic skills trainers: the weakest link! In: Dohi T, Kikinis R, editors. *Lecture Notes in Computer Science.* Berlin Heidelberg: Springer-Verlag; 2002. p. 35-43.

53. Datta V, Mandalia M, Mackay S, Darzi A. The PreOp flexible sigmoidoscopy trainer. Validation and early evaluation of a virtual reality based system. *Surg Endosc.* 2002;16:1459-1463.
54. Ferlitsch A, Glauinger P, Gupper A, Schillinger M, Haefner M, Gangl A, et al. Evaluation of a virtual endoscopy simulator for training in gastrointestinal endoscopy. *Endoscopy.* 2002;34:698-702.
55. Forrest FC, Taylor MA, Postlethwaite K, Aspinall R. Use of a high-fidelity simulator to develop testing of the technical performance of novice anaesthetists. *Br J Anaesth.* 2002;88:338-344.
56. Francis NK, Hanna GB, Cuschieri A. The performance of master surgeons on the Advanced Dundee Endoscopic Psychomotor Tester: contrast validity study. *Arch Surg.* 2002;137:841-844.
57. Gallagher AG, Satava RM. Virtual reality as a metric for the assessment of laparoscopic psychomotor skills. Learning curves and reliability measures. *Surg Endosc.* 2002;16:1746-1752.
58. Haluck RS, Gallagher AG, Satava RM, Webster R, Bass TL, Miller CA. Reliability and validity of EndoTower, a virtual reality trainer for angled endoscope navigation. *Stud Health Technol Inform.* 2002;85:179-184.
59. Jones T, Cason CL, Mancini ME. Evaluating nurse competency: evidence of validity for a skills recredentialing program. *J Prof Nurs.* 2002;18:22-28.
60. Murray D, Boulet J, Ziv A, Woodhouse J, Kras J, McAllister J. An acute care skills evaluation for graduating medical students: a pilot study using clinical simulation. *Med Educ.* 2002;36:833-841.
61. Neumann M, Friedl S, Meining A, Egger K, Heldwein W, Rey J-F, et al. A score card for upper GI endoscopy: evaluation of interobserver variability in examiners with various levels of experience. *Z Gastroenterol.* 2002;40:857-862.
62. Pugh CM, Youngblood P. Development and validation of assessment measures for a newly developed physical examination simulator. *J Am Med Inform Assoc.* 2002;9:448-460.
63. Reznek MA, Rawn CL, Krummel TM. Evaluation of the educational effectiveness of a virtual reality intravenous insertion simulator. *Acad Emerg Med.* 2002;9:1319-1325.
64. Schijven M, Jakimowicz J. Face-, expert, and referent validity of the Xitact LS500 laparoscopy simulator. *Surg Endosc.* 2002;16:1764-1770.
65. Schijven MP, Jakimowicz J, Schot C. The Advanced Dundee Endoscopic Psychomotor Tester (ADEPT) objectifying subjective psychomotor test performance. *Surg Endosc.* 2002;16:943-948.
66. Schwid HA, Rooke GA, Carline J, Steadman RH, Murray WB, Olympio M, et al. Evaluation of anesthesia residents using mannequin-based simulation: a multiinstitutional study. *Anesthesiology.* 2002;97:1434-1444.
67. Shah J, Darzi A. Virtual reality flexible cystoscopy: a validation study. *BJU Int.* 2002;90:828-832.
68. Smith SG, Torkington J, Brown TJ, Taffinder NJ, Darzi A. Motion analysis: a tool for assessing laparoscopic dexterity in the performance of a laboratory-based laparoscopic cholecystectomy. *Surg Endosc.* 2002;16:640-645.
69. Adrales GL, Chu UB, Witzke DB, Donnelly MB, Hoskins D, Mastrangelo MJ, Jr., et al. Evaluating minimally invasive surgery training using low-cost mechanical simulations. *Surg Endosc.* 2003;17:580-585.
70. Adrales GL, Park AE, Chu UB, Witzke DB, Donnelly MB, Hoskins JD, et al. A valid method of laparoscopic simulation training and competence assessment. *J Surg Res.* 2003;114:156-162.
71. Bann S, Datta V, Khan M, Darzi A. The surgical error examination is a novel method for objective technical knowledge assessment. *Am J Surg.* 2003;185:507-511.
72. Bann S, Kwok K-F, Lo C-Y, Darzi A, Wong J. Objective assessment of technical skills of surgical trainees in Hong Kong. *Br J Surg.* 2003;90:1294-1299.
73. Bann SD, Khan MS, Darzi AW. Measurement of surgical dexterity using motion analysis of simple bench tasks. *World J Surg.* 2003;27:390-394.
74. Bloom MB, Rawn CL, Salzberg AD, Krummel TM. Virtual reality applied to procedural testing: the next era. *Ann Surg.* 2003;237:442-448.
75. Boulet JR, Murray D, Kras J, Woodhouse J, McAllister J, Ziv A. Reliability and validity of a simulation-based acute care skills assessment for medical students and residents. *Anesthesiology.* 2003;99:1270-1280.
76. Fraser SA, Klassen DR, Feldman LS, Ghitulescu GA, Stanbridge D, Fried GM. Evaluating laparoscopic skills: setting the pass/fail score for the MISTELS system. *Surg Endosc.* 2003;17:964-967.
77. Gallagher AG, Smith CD, Bowers SP, Seymour NE, Pearson A, McNatt S, et al. Psychomotor skills assessment in practicing surgeons experienced in performing advanced laparoscopic procedures. *J Am Coll Surg.* 2003;197:479-488.
78. Gordon JA, Tancredi DN, Binder WD, Wilkerson WM, Shaffer DW. Assessment of a clinical performance evaluation tool for use in a simulator-based testing environment: a pilot study. *Acad Med.* 2003;78(10 Suppl):S45-S47.
79. Grantcharov TP, Bardram L, Funch-Jensen P, Rosenberg J. Learning curves and impact of previous operative experience on performance on a virtual reality simulator to test laparoscopic surgical skills. *Am J Surg.* 2003;185:146-149.
80. Gray SA, Deem LP, Sisson JA, Hammrich PL. The predictive utility of computer-simulated exercises for preclinical technique performance. *J Dent Educ.* 2003;67:1229-1233.

Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).

81. Imber S, Shapira G, Gordon M, Judes H, Metzger Z. A virtual reality dental simulator predicts performance in an operative dentistry manikin course. *Eur J Dent Educ.* 2003;7:160-163.
82. Khan MS, Bann SD, Darzi A, Butler PEM. Use of suturing as a measure of technical competence. *Ann Plast Surg.* 2003;50:304-308; discussion 308-309.
83. MacDonald J, Ketchum J, Williams RG, Rogers LQ. A lay person vs a trained endoscopist: can the preop endoscopy simulator detect a difference? *Surg Endosc.* 2003;17:896-898.
84. Mahmood T, Darzi A. A study to validate the colonoscopy simulator: it is usefully discriminatory for more than one measurable outcome. *Surg Endosc.* 2003;17:1583-1589.
85. Moorthy K, Smith S, Brown T, Bann S, Darzi A. Evaluation of virtual reality bronchoscopy as a learning and assessment tool. *Respiration.* 2003;70:195-199.
86. Murphy AA, Halamek LP, Lyell DJ, Druzin ML. Evaluation of a novel electronic fetal monitor simulator. *Stud Health Technol Inform.* 2003;94:240-244.
87. Neumann M, Hahn C, Horbach T, Schneider I, Meining A, Heldwein W, et al. Score card endoscopy: a multicenter study to evaluate learning curves in 1-week courses using the Erlangen Endo-Trainer. *Endoscopy.* 2003;35:515-520.
88. Neumann M, Siebert T, Rausch J, Horbach T, Ell C, Manegold BC, et al. Scorecard endoscopy: a pilot study to assess basic skills in trainees for upper gastrointestinal endoscopy. *Langenbeck's Archives of Surgery.* 2003;387:386-391.
89. Nielsen PE, Foglia LM, Mandel LS, Chow GE. Objective structured assessment of technical skills for episiotomy repair. *Am J Obstet Gynecol.* 2003;189:1257-1260.
90. Ritter EM, McClusky DA, III, Lederman AB, Gallagher AG, Smith CD. Objective psychomotor skills assessment of experienced and novice flexible endoscopists with a virtual reality simulator. *J Gastrointest Surg.* 2003;7:871-877.
91. Schijven M, Jakimowicz J. Construct validity: experts and novices performing on the Xitact LS500 laparoscopy simulator. *Surg Endosc.* 2003;17:803-810.
92. Sedlack RE, Kolars JC. Validation of a computer-based colonoscopy simulator. *Gastrointest Endosc.* 2003;57:214-218.
93. Sung WH, Fung CP, Chen ACY, Yuan CC, Ng HT, Doong JL. The assessment of stability and reliability of a virtual reality-based laparoscopic gynecology simulation system. *Eur J Gynaecol Oncol.* 2003;24:143-146.
94. Terkamp C, Kirchner G, Wedemeyer J, Dettmer A, Kielstein J, Reindell H, et al. Simulation of abdomen sonography. Evaluation of a new ultrasound simulator. *Ultraschall Med.* 2003;24:239-234.
95. Tsai T-C, Harasym PH, Nijssen-Jordan C, Jennett P, Powell G. The quality of a simulation examination using a high-fidelity child manikin. *Med Educ.* 2003;37(Suppl 1):72-78.
96. Weller JM, Bloch M, Young S, Maze M, Oyesola S, Wyner J, et al. Evaluation of high fidelity patient simulator in assessment of performance of anaesthetists. *Br J Anaesth.* 2003;90:43-47.
97. Datta V, Bann S, Beard J, Mandalia M, Darzi A. Comparison of bench test evaluations of surgical skill with live operating performance assessments. *J Am Coll Surg.* 2004;199:603-606.
98. Feldman LS, Hagarty SE, Ghitulescu G, Stanbridge D, Fried GM. Relationship between objective assessment of technical skills and subjective in-training evaluations in surgical residents. *J Am Coll Surg.* 2004;198:105-110.
99. Fried GM, Feldman LS, Vassiliou MC, Fraser SA, Stanbridge D, Ghitulescu G, et al. Proving the value of simulation in laparoscopic surgery. *Ann Surg.* 2004;240:518-525.
100. Gallagher AG, Lederman AB, McGlade K, Satava RM, Smith CD. Discriminative validity of the Minimally Invasive Surgical Trainer in Virtual Reality (MIST-VR) using criteria levels based on expert performance. *Surg Endosc.* 2004;18:660-665.
101. Gisondi MA, Smith-Coggins R, Harter PM, Solysik RC, Yarnold PR. Assessment of resident professionalism using high-fidelity simulation of ethical dilemmas. *Acad Emerg Med.* 2004;11:931-937.
102. Hsu JH, Younan D, Pandalai S, Gillespie BT, Jain RA, Schippert DW, et al. Use of computer simulation for determining endovascular skill levels in a carotid stenting model. *J Vasc Surg.* 2004;40:1118-1125.
103. Johnson DB, Kondraske GV, Wilhelm DM, Jacomides L, Ogan K, Pearle MS, et al. Assessment of basic human performance resources predicts the performance of virtual ureterorenoscopy. *J Urol.* 2004;171:80-84.
104. Kropmans TJB, Cosic K. Assessment of 'borderline' clinical competence using generalisability and decision studies in dental skills training. *Eur J Dent Educ.* 2004;8:127-132.
105. Moorthy K, Munz Y, Dosis A, Bello F, Chang A, Darzi A. Bimodal assessment of laparoscopic suturing skills: construct and concurrent validity. *Surg Endosc.* 2004;18:1608-1612.
106. Moorthy K, Munz Y, Jiwanji M, Bann S, Chang A, Darzi A. Validity and reliability of a virtual reality upper gastrointestinal simulator and cross validation using structured assessment of individual performance with video playback. *Surg Endosc.* 2004;18:328-333.
107. Moorthy K, Munz Y, Orchard TR, Gould S, Rockall T, Darzi A. An innovative method for the assessment of skills in lower gastrointestinal endoscopy. *Surg Endosc.* 2004;18:1613-1619.
108. Morgan PJ, Cleave-Hogg D, DeSousa S, Tarshis J. High-fidelity patient simulation: validation of performance checklists. *Br J Anaesth.* 2004;92:388-392.

- Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).
109. Murray DJ, Boulet JR, Kras JF, Woodhouse JA, Cox T, McAllister JD. Acute care skills in anesthesia practice: a simulation-based resident performance assessment. *Anesthesiology.* 2004;101:1084-1095.
 110. Rosenstock C, Ostergaard D, Kristensen MS, Lippert A, Ruhnau B, Rasmussen LS. Residents lack knowledge and practical skills in handling the difficult airway. *Acta Anaesthesiol Scand.* 2004;48:1014-1018.
 111. Rossi JV, Verma D, Fujii GY, Lakhapal RR, Wu SL, Humayun MS, et al. Virtual vitreoretinal surgical simulator as a training tool. *Retina.* 2004;24:231-236.
 112. Schijven MP, Jakimowicz JJ, Carter FJ. How to select aspirant laparoscopic surgical trainees: establishing concurrent validity comparing Xitact LS500 index performance scores with standardized psychomotor aptitude test battery scores. *J Surg Res.* 2004;121:112-119.
 113. Sokollik C, Gross J, Buess G. New model for skills assessment and training progress in minimally invasive surgery. *Surg Endosc.* 2004;18:495-500.
 114. Srivastava S, Youngblood PL, Rawn C, Hariri S, Heinrichs WL, Ladd AL. Initial evaluation of a shoulder arthroscopy simulator: Establishing construct validity. *J Shoulder Elbow Surg.* 2004;13:196-205.
 115. Stylopoulos N, Cotin S, Maithel SK, Ottensmeyer M, Jackson PG, Bardsley RS, et al. Computer-enhanced laparoscopic training system (CELTS): bridging the gap. *Surg Endosc.* 2004;18:782-789.
 116. Sweet R, Kowalewski T, Oppenheimer P, Weghorst S, Satava R. Face, content and construct validity of the University of Washington virtual reality transurethral prostate resection trainer. *J Urol.* 2004;172:1953-1957.
 117. Weller J, Robinson B, Larsen P, Caldwell C. Simulation-based training to improve acute care skills in medical undergraduates. *N Z Med J.* 2004;117:U1119.
 118. Adamsen S, Funch-Jensen PM, Drewes AM, Rosenberg J, Grantcharov TP. A comparative study of skills in virtual laparoscopy and endoscopy. *Surg Endosc.* 2005;19:229-234.
 119. Arora H, Uribe J, Ralph W, Zeletsan M, Cuellar H, Gallagher A, et al. Assessment of construct validity of the endoscopic sinus surgery simulator. *Arch Otolaryngol Head Neck Surg.* 2005;131:217-221.
 120. Avgerinos DV, Goodell KH, Waxberg S, Cao CGL, Schwitzberg SD. Comparison of the sensitivity of physical and virtual laparoscopic surgical training simulators to the user's level of experience. *Surg Endosc.* 2005;19:1211-1215.
 121. Bann S, Davis IM, Moorthy K, Munz Y, Hernandez J, Khan M, et al. The reliability of multiple objective measures of surgery and the role of human performance. *Am J Surg.* 2005;189:747-752.
 122. Beard JD, Jolly BC, Newble DI, Thomas WEG, Donnelly J, Southgate LJ. Assessing the technical skills of surgical trainees. *Br J Surg.* 2005;92:778-782.
 123. Beard JD, Jolly BC, Southgate LJ, Newble DI, Thomas EG, Rochester J. Developing assessments of surgical skills for the GMC Performance Procedures. *Ann R Coll Surg Engl.* 2005;87:242-247.
 124. Berkenstadt H, Kantor GS, Yusim Y, Gafni N, Perel A, Ezri T, et al. The feasibility of sharing simulation-based evaluation scenarios in anesthesiology. *Anesth Analg.* 2005;101:1068-1074.
 125. Blum RH, Raemer DB, Carroll JS, Dufresne RL, Cooper JB. A method for measuring the effectiveness of simulation-based team training for improving communication skills. *Anesth Analg.* 2005;100:1375-1380.
 126. Crofts JF, Attikakos G, Read M, Sibanda T, Draycott TJ. Shoulder dystocia training using a new birth training mannequin. *BJOG.* 2005;112:997-999.
 127. Curran VR, Aziz K, O'Young S, Bessell C, Schulz H. A comparison of face-to-face versus remote assessment of neonatal resuscitation skills. *J Telemed Telecare.* 2005;11:97-102.
 128. Dauster B, Steinberg AP, Vassiliou MC, Bergman S, Stanbridge DD, Feldman LS, et al. Validity of the MISTELS simulator for laparoscopy training in urology. *J Endourol.* 2005;19:541-545.
 129. Dubrowski A, Sidhu R, Park J, Carnahan H. Quantification of motion characteristics and forces applied to tissues during suturing. *Am J Surg.* 2005;190:131-136.
 130. Duffy AJ, Hogle NJ, McCarthy H, Lew JI, Egan A, Christos P, et al. Construct validity for the LAPSIM laparoscopic surgical simulator. *Surg Endosc.* 2005;19:401-405.
 131. Eriksen JR, Grantcharov T. Objective assessment of laparoscopic skills using a virtual reality simulator[corrected]. *Surg Endosc.* 2005;19:1216-1219.
 132. Felsher JJ, Olesevich M, Farres H, Rosen M, Fanning A, Dunkin BJ, et al. Validation of a flexible endoscopy simulator. *Am J Surg.* 2005;189:497-500.
 133. Fichera A, Prachand V, Kives S, Levine R, Hasson H. Physical reality simulation for training of laparoscopists in the 21st century. A multispecialty, multi-institutional study. *J Soc Laparoendosc Surg.* 2005;9:125-129.
 134. Grantcharov TP, Carstensen L, Schulze S. Objective assessment of gastrointestinal endoscopy skills using a virtual reality simulator. *J Soc Laparoendosc Surg.* 2005;9:130-133.
 135. Hance J, Aggarwal R, Stanbridge R, Blauth C, Munz Y, Darzi A, et al. Objective assessment of technical skills in cardiac surgery. *Eur J Cardiothorac Surg.* 2005;28:157-162.
 136. Hesselfeldt R, Kristensen MS, Rasmussen LS. Evaluation of the airway of the SimMan™ full-scale patient simulator. *Acta Anaesthesiol Scand.* 2005;49:1339-1345.
 137. Kallstrom R, Hjertberg H, Kjolhede H, Svanvik J. Use of a virtual reality, real-time, simulation model for the training of urologists in transurethral resection of the prostate. *Scand J Urol Nephrol.* 2005;39:313-320.

Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).

138. Katz R, Hoznek A, Salomon L, Antiphon P, de la Taille A, Abbou CC. Skill assessment of urological laparoscopic surgeons: Can criterion levels of surgical performance be determined using the pelvic box trainer? *Eur Urol.* 2005;47:482-487.
139. Korndorffer JR, Jr., Clayton JL, Tesfay ST, Brunner WC, Sierra R, Dunne JB, et al. Multicenter construct validity for Southwestern laparoscopic videotrainer stations. *J Surg Res.* 2005;128:114-119.
140. Lebuffe G, Plateau S, Tytgat H, Vallet B, Scherpereel P. Interest of mannequin based simulator to evaluate anaesthesia residents [French]. *Ann Fr Anesth Reanim.* 2005;24:260-269.
141. Madan AK, Frantzides CT, Sasso LM. Laparoscopic baseline ability assessment by virtual reality. *J Laparoendosc Adv Surg Tech.* 2005;15:13-17.
142. Madan AK, Frantzides CT, Tebbit C, Shervin N. Self-reported vs observed scores in laparoscopic skills training. *Surg Endosc.* 2005;19:670-672.
143. Moorthy K, Munz Y, Adams S, Pandey V, Darzi A. A human factors analysis of technical and team skills among surgical trainees during procedural simulations in a simulated operating theatre. *Ann Surg.* 2005;242:631-639.
144. Murray DJ, Boulet JR, Kras JF, McAllister JD, Cox TE. A simulation-based acute skills performance assessment for anesthesia training. *Anesth Analg.* 2005;101:1127-1134.
145. Neumann M, Meining A, Buerschaper C, Reingruber B, Rosch T, Hohenberger W, et al. Training in GI endoscopy: can we objectively predict the performance of trainees? a prospective correlation study. *Z Gastroenterol.* 2005;43:445-450.
146. Ro CY, Toumpoulis IK, Ashton RC, Jr., Jebara T, Schulman C, Todd GJ, et al. The LapSim: a learning environment for both experts and novices. *Stud Health Technol Inform.* 2005;111:414-417.
147. Sereno-Trabaldo S, Fregoso-Ambriz JM, Gaxiola-Robles R, Zermenio-Hernandez J, Garcia-Iniguez JA, Gonzalez-Ojeda A. Measurement of the development of psychomotor abilities in surgical endoscopy training with the use of a simulator and biological pieces [Spanish]. *Cir Cir.* 2005;73:113-118.
148. Sherman V, Feldman LS, Stanbridge D, Kazmi R, Fried GM. Assessing the learning curve for the acquisition of laparoscopic skills on a virtual reality simulator. *Surg Endosc.* 2005;19:678-682.
149. Stefanidis D, Korndorffer JR, Jr., Sierra R, Touchard C, Dunne JB, Scott DJ. Skill retention following proficiency-based laparoscopic simulator training. *Surgery.* 2005;138:165-170.
150. Stitik TP, Foye PM, Nadler SF, Chen B, Schoenherr L, Von Hagen S. Injections in patients with osteoarthritis and other musculoskeletal disorders: use of synthetic injection models for teaching physiatry residents. *Am J Phys Med Rehabil.* 2005;84:550-559.
151. Uchal M, Raftopoulos Y, Tjugum J, Bergamaschi R. Validation of a six-task simulation model in minimally invasive surgery. *Surg Endosc.* 2005;19:109-116.
152. Van Sickle KR, McClusky DA, III, Gallagher AG, Smith CD. Construct validation of the ProMIS simulator using a novel laparoscopic suturing task. *Surg Endosc.* 2005;19:1227-1231.
153. Weller JM, Robinson BJ, Jolly B, Watterson LM, Joseph M, Bajenov S, et al. Psychometric characteristics of simulation-based assessment in anaesthesia and accuracy of self-assessed scores. *Anaesthesia.* 2005;60:245-250.
154. Aggarwal R, Black SA, Hance JR, Darzi A, Cheshire NJW. Virtual reality simulation training can improve inexperienced surgeons' endovascular skills. *Eur J Vasc Endovasc Surg.* 2006;31:588-593.
155. Ayodeji ID, Schijven MP, Jakimowicz JJ. Determination of face validity for the Simbionix LAP mentor virtual reality training module. *Stud Health Technol Inform.* 2006;119:28-30.
156. Bergus G, Kreiter C, Woodhead J, Lawrence J, Franklin E. Using infant mannequins in objective standardized clinical examinations: are there unintended consequences? *Ambul Pediatr.* 2006;6:235-238.
157. Berkenstadt H, Ziv A, Gafni N, Sidi A. The validation process of incorporating simulation-based accreditation into the anesthesiology Israeli national board exams. *Isr Med Assoc J.* 2006;8:728-733.
158. Berry M, Lystig T, Reznick R, Lonn L. Assessment of a virtual interventional simulator trainer. *J Endovasc Ther.* 2006;13:237-243.
159. Black M, Gould JC. Measuring laparoscopic operative skill in a video trainer. *Surg Endosc.* 2006;20:1069-1071.
160. Broe D, Ridgway PF, Johnson S, Tierney S, Conlon KC. Construct validation of a novel hybrid surgical simulator. *Surg Endosc.* 2006;20:900-904.
161. Chen J-S, Hsu H-H, Lai I-R, Tai H-C, Lai H-S, Lee Y-C, et al. Validation of a computer-based bronchoscopy simulator developed in Taiwan. *J Formos Med Assoc.* 2006;105:569-576.
162. Datta V, Bann S, Mandalia M, Darzi A. The surgical efficiency score: a feasible, reliable, and valid method of skills assessment. *Am J Surg.* 2006;192:372-378.
163. Dupuis O, Moreau R, Silveira R, Pham MT, Zentner A, Cucherat M, et al. A new obstetric forceps for the training of junior doctors: a comparison of the spatial dispersion of forceps blade trajectories between junior and senior obstetricians. *Am J Obstet Gynecol.* 2006;194:1524-1531.
164. Enochsson L, Westman B, Ritter EM, Hedman L, Kjellin A, Wredmark T, et al. Objective assessment of visuospatial and psychomotor ability and flow of residents and senior endoscopists in simulated gastroscopy. *Surg Endosc.* 2006;20:895-899.

Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).

165. Gould DA, Healey AE, Johnson SJ, Lewandowski WE, Kessel DO. Metrics for an interventional radiology curriculum: a case for standardisation? *Stud Health Technol Inform.* 2006;119:159-164.
166. Hislop SJ, Hsu JH, Narins CR, Gillespie BT, Jain RA, Schippert DW, et al. Simulator assessment of innate endovascular aptitude versus empirically correct performance. *J Vasc Surg.* 2006;43:47-55.
167. Kim J, Neilipovitz D, Cardinal P, Chiu M, Clinch J. A pilot study using high-fidelity simulation to formally evaluate performance in the resuscitation of critically ill patients. *Crit Care Med.* 2006;34:2167-2174.
168. Knudsen BE, Matsumoto ED, Chew BH, Johnson B, Margulis V, Cadeddu JA, et al. A randomized, controlled, prospective study validating the acquisition of percutaneous renal collecting system access skills using a computer based hybrid virtual reality surgical simulator: phase I. *J Urol.* 2006;176:2173-2178.
169. Larsen CR, Grantcharov T, Aggarwal R, Tully A, Sorensen JL, Dalsgaard T, et al. Objective assessment of gynecologic laparoscopic skills using the LapSimGyn virtual reality simulator. *Surg Endosc.* 2006;20:1460-1466.
170. Lockyer J, Singhal N, Fidler H, Weiner G, Aziz K, Curran V. The development and testing of a performance checklist to assess neonatal resuscitation megacode skill. *Pediatrics.* 2006;118:e1739-e1744.
171. Maithel S, Sierra R, Korndorffer J, Neumann P, Dawson S, Callery M, et al. Construct and face validity of MIST-VR, Endotower, and CELTS: are we ready for skills assessment using simulators? *Surg Endosc.* 2006;20:104-112.
172. Matsumoto ED, Pace KT, D'A Honey RJ. Virtual reality ureteroscopy simulator as a valid tool for assessing endourological skills. *Int J Urol.* 2006;13:896-901.
173. McCarthy AD, Moody L, Waterworth AR, Bickerstaff DR. Passive haptics in a knee arthroscopy simulator: is it valid for core skills training? *Clin Orthop.* 2006;442:13-20.
174. McDougall EM, Corica FA, Boker JR, Sala LG, Stolar G, Borin JF, et al. Construct validity testing of a laparoscopic surgical simulator. *J Am Coll Surg.* 2006;202:779-787.
175. McKenzie FD, Hubbard TW, Ullian JA, Garcia HM, Castelino RJ, Gliva GA. Medical student evaluation using augmented standardized patients: preliminary results. *Stud Health Technol Inform.* 2006;119:379-384.
176. Moorthy K, Munz Y, Forrest D, Pandey V, Undre S, Vincent C, et al. Surgical crisis management skills training and assessment: a simulation[corrected]-based approach to enhancing operating room performance. *Ann Surg.* 2006;244:139-147.
177. Morris D, Sewell C, Barbagli F, Salisbury K, Blevins NH, Girod S. Visuoaptic simulation of bone surgery for training and evaluation. *IEEE comput.* 2006;26:48-57.
178. Nicholson WJ, Cates CU, Patel AD, Niazi K, Palmer S, Helmy T, et al. Face and content validation of virtual reality simulation for carotid angiography: results from the first 100 physicians attending the Emory NeuroAnatomy Carotid Training (ENACT) program. *Simul Healthc.* 2006;1:147-150.
179. Pandey VA, Wolfe JHN, Liapis CD, Bergqvist D, on behalf of the European Board of Vascular Surgery. The examination assessment of technical competence in vascular surgery. *Br J Surg.* 2006;93:1132-1138.
180. Patel AD, Gallagher AG, Nicholson WJ, Cates CU. Learning curves and reliability measures for virtual reality simulation in the performance assessment of carotid angiography. *J Am Coll Cardiol.* 2006;47:1796-1802.
181. Rosenthal R, Gantert WA, Scheidegger D, Oertli D. Can skills assessment on a virtual reality trainer predict a surgical trainee's talent in laparoscopic surgery? *Surg Endosc.* 2006;20:1286-1290.
182. Savoldelli GL, Naik VN, Joo HS, Houston PL, Graham M, Yee B, et al. Evaluation of patient simulator performance as an adjunct to the oral examination for senior anesthesia residents. *Anesthesiology.* 2006;104:475-481.
183. Scavone BM, Sproviero MT, McCarthy RJ, Wong CA, Sullivan JT, Siddall VJ, et al. Development of an objective scoring system for measurement of resident performance on the human patient simulator. *Anesthesiology.* 2006;105:260-266.
184. Shah J, Munz Y, Manson J, Moorthy K, Darzi A. Objective assessment of small bowel anastomosis skill in trainee general surgeons and urologists. *World J Surg.* 2006;30:248-251.
185. Swanstrom LL, Fried GM, Hoffman KI, Soper NJ. Beta test results of a new system assessing competence in laparoscopic surgery. *J Am Coll Surg.* 2006;202:62-69.
186. Vassiliou MC, Ghitulescu GA, Feldman LS, Stanbridge D, Leffondré K, Sigman HH, et al. The MISTELS program to measure technical skill in laparoscopic surgery: Evidence for reliability. *Surg Endosc.* 2006;20:744-747.
187. Verdaasdonk EGG, Stassen LPS, Monteny LJ, Dankelman J. Validation of a new basic virtual reality simulator for training of basic endoscopic skills: The SIMENDO. *Surg Endosc.* 2006;20:511-518.
188. Woodrum DT, Andreatta PB, Yellamanchilli RK, Feryus L, Gauger PG, Minter RM. Construct validity of the LapSim laparoscopic surgical simulator. *Am J Surg.* 2006;191:28-32.
189. van der Heide PA, van Toledo-Eppinga L, van der Heide M, van der Lee JH. Assessment of neonatal resuscitation skills: a reliable and valid scoring system. *Resuscitation.* 2006;71:212-221.
190. Adler MD, Trainor JL, Siddall VJ, McGaghie WC. Development and evaluation of high-fidelity simulation case scenarios for pediatric resident education. *Ambul Pediatr.* 2007;7:182-186.

Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).

191. Ahlberg G, Enochsson L, Gallagher AG, Hedman L, Hogman C, McClusky DA, III, et al. Proficiency-based virtual reality training significantly reduces the error rate for residents during their first 10 laparoscopic cholecystectomies. *Am J Surg.* 2007;193:797-804.
192. Ayodeji ID, Schijven M, Jakimowicz J, Greve JW. Face validation of the Simbionix LAP Mentor virtual reality training module and its applicability in the surgical curriculum. *Surg Endosc.* 2007;21:1641-1649.
193. Black SA, Harrison RH, Horrocks EJ, Pandey VA, Wolfe JH. Competence assessment of senior vascular trainees using a carotid endarterectomy bench model. *Br J Surg.* 2007;94:1226-1231.
194. Botden SMBI, Buzink SN, Schijven MP, Jakimowicz JJ. Augmented versus virtual reality laparoscopic simulation: what is the difference? A comparison of the ProMIS augmented reality laparoscopic simulator versus LapSim virtual reality laparoscopic simulator. *World J Surg.* 2007;31:764-772.
195. Butler NN, Wiet GJ. Reliability of the Welling Scale (WS1) for rating temporal bone dissection performance. *Laryngoscope.* 2007;117:1803-1808.
196. Curtis DA, Lind SL, Brear S, Finzen FC. The correlation of student performance in preclinical and clinical prosthodontic assessments. *J Dent Educ.* 2007;71:365-372.
197. Duncan JR, Kline B, Glaiberman CB. Analysis of simulated angiographic procedures. Part 2: extracting efficiency data from audio and video recordings. *J Vasc Interv Radiol.* 2007;18:535-544.
198. Fialkow M, Mandel L, VanBlaricom A, Chinn M, Lentz G, Goff B. A curriculum for Burch colposuspension and diagnostic cystoscopy evaluated by an objective structured assessment of technical skills. *Am J Obstet Gynecol.* 2007;197:544.e541-e546.
199. Fried MP, Sadoughi B, Weghorst SJ, Zeltsan M, Cuellar H, Uribe JI, et al. Construct validity of the endoscopic sinus surgery simulator: II. Assessment of discriminant validity and expert benchmarking. *Archives of Otolaryngology--Head & Neck Surgery.* 2007;133:350-357.
200. Girzadas DV, Jr, Clay L, Caris J, Rzechula K, Harwood R. High fidelity simulation can discriminate between novice and experienced residents when assessing competency in patient care. *Med Teach.* 2007;29:472-476.
201. Goff BA, VanBlaricom A, Mandel L, Chinn M, Nielsen P. Comparison of objective, structured assessment of technical skills with a virtual reality hysteroscopy trainer and standard latex hysteroscopy model. *J Reprod Med.* 2007;52:407-412.
202. Gomoll AH, O'Toole RV, Czarnecki J, Warner JJP. Surgical experience correlates with performance on a virtual reality simulator for shoulder arthroscopy. *Am J Sports Med.* 2007;35:883-888.
203. Heinrichs WL, Lukoff B, Youngblood P, Dev P, Shavelson R, Hasson HM, et al. Criterion-based training with surgical simulators: proficiency of experienced surgeons. *J Soc Laparoendosc Surg.* 2007;11:273-302.
204. Hemman EA, Gillingham D, Allison N, Adams R. Evaluation of a combat medic skills validation test. *Mil Med.* 2007;172:843-851.
205. Hogle NJ, Briggs WM, Fowler DL. Documenting a learning curve and test-retest reliability of two tasks on a virtual reality training simulator in laparoscopic surgery. *J Surg Educ.* 2007;64:424-430.
206. Khan MS, Bann SD, Darzi AW, Butler PE. Assessing surgical skill using bench station models. *Plast Reconstr Surg.* 2007;120:793-800.
207. Leung JW, Lee JG, Rojany M, Wilson R, Leung FW. Development of a novel ERCP mechanical simulator. *Gastrointest Endosc.* 2007;65:1056-1062.
208. Mackel TR, Rosen J, Pugh CM. Markov model assessment of subjects' clinical skill using the E-Pelvis physical simulator. *IEEE Trans Biomed Eng.* 2007;54:2133-2141.
209. Malec JF, Torsher LC, Dunn WF, Wiegmann DA, Arnold JJ, Brown DA, et al. The Mayo High Performance Teamwork Scale: reliability and validity for evaluating key crew resource management skills. *Simul Healthc.* 2007;2:4-10.
210. Mathis KL, Wiegmann DA. Construct validation of a laparoscopic surgical simulator. *Simul Healthc.* 2007;2:178-182.
211. McCluney AL, Vassiliou MC, Kaneva PA, Cao J, Stanbridge DD, Feldman LS, et al. FLS simulator performance predicts intraoperative laparoscopic skill. *Surg Endosc.* 2007;21:1991-1995.
212. Moreau R, Ochoa V, Pham MT, Boulanger P, Redarce T, Dupuis O. Evaluation of obstetric gestures: an approach based on the curvature of 3-D positions. *Conf Proc IEEE Eng Med Biol Soc.* 2007;2007:3634-3637.
213. Morgan PJ, Lam-McCulloch J, Herold-McIlroy J, Tarshis J. Simulation performance checklist generation using the Delphi technique. *Can J Anaesth.* 2007;54:992-997.
214. Morgan PJ, Pittini R, Regehr G, Marrs C, Haley MF. Evaluating teamwork in a simulated obstetric environment. *Anesthesiology.* 2007;106:907-915.
215. Murray DJ, Boulet JR, Avidan M, Kras JF, Henrichs B, Woodhouse J, et al. Performance of residents and anesthesiologists in a simulation-based skill assessment. *Anesthesiology.* 2007;107:705-713.
216. Newmark J, Dandolu V, Milner R, Grewal H, Harbison S, Hernandez E. Correlating virtual reality and box trainer tasks in the assessment of laparoscopic surgical skills. *Am J Obstet Gynecol.* 2007;197:546.e541-e544.
217. Nistor V, Allen B, Dutson E, Faloutsos P, Carman GP. Immersive training and mentoring for laparoscopic surgery. *Proceedings of SPIE - The International Society for Optical Engineering.* 2007;6528:Article 65280Q.

Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).

218. Ottestad E, Boulet JR, Lighthall GK. Evaluating the management of septic shock using patient simulation. *Crit Care Med.* 2007;35:769-775.
219. Park J, MacRae H, Musselman LJ, Rossos P, Hamstra SJ, Wolman S, et al. Randomized controlled trial of virtual reality simulator training: transfer to live patients. *Am J Surg.* 2007;194:205-211.
220. Rashid HH, Kowalewski T, Oppenheimer P, Ooms A, Krieger JN, Sweet RM. The virtual reality transurethral prostatic resection trainer: evaluation of discriminative validity. *J Urol.* 2007;177:2283-2286.
221. Ringsted C, Lippert F, Hesselfeldt R, Rasmussen MB, Mogensen SS, Frost T, et al. Assessment of Advanced Life Support competence when combining different test methods--reliability and validity. *Resuscitation.* 2007;75:153-160.
222. Ritter EM, Kindelan TW, Michael C, Pimentel EA, Bowyer MW. Concurrent validity of augmented reality metrics applied to the fundamentals of laparoscopic surgery (FLS). *Surg Endosc.* 2007;21:1441-1445.
223. Rosenthal R, Gantert WA, Hamel C, Hahnloser D, Metzger J, Kocher T, et al. Assessment of construct validity of a virtual reality laparoscopy simulator. *J Laparoendosc Adv Surg Tech A.* 2007;17:407-413.
224. Sedlack RE. Validation of computer simulation training for esophagogastroduodenoscopy: Pilot study. *J Gastroenterol Hepatol.* 2007;22:1214-1219.
225. Sedlack RE, Baron TH, Downing SM, Schwartz AJ. Validation of a colonoscopy simulation model for skills assessment. *Am J Gastroenterol.* 2007;102:64-74.
226. Sewell C, Morris D, Blevins NH, Agrawal S, Dutta S, Barbagli F, et al. Validating metrics for a mastoidectomy simulator. *Stud Health Technol Inform.* 2007;125:421-426.
227. Sharaf AA, AbdelAziz AM, El Meligy OAS. Intra- and inter-examiner variability in evaluating preclinical pediatric dentistry operative procedures. *J Dent Educ.* 2007;71:540-544.
228. Siddighi S, Kleeman SD, Baggish MS, Rooney CM, Pauls RN, Karram MM. Effects of an educational workshop on performance of fourth-degree perineal laceration repair. *Obstet Gynecol.* 2007;109:289-294.
229. Stefanidis D, Haluck R, Pham T, Dunne JB, Reinke T, Markley S, et al. Construct and face validity and task workload for laparoscopic camera navigation: virtual reality versus videotrainer systems at the SAGES Learning Center. *Surg Endosc.* 2007;21:1158-1164.
230. Stefanidis D, Scerbo MW, Korndorffer JR, Jr., Scott DJ. Redefining simulator proficiency using automaticity theory. *Am J Surg.* 2007;193:502-506.
231. Sudhir G, Stacey MRW, Hampson M, Mecklenburgh J. Evaluation of the Basic Airway Model, a novel mask ventilation training manikin. *Anaesthesia.* 2007;62:944-947.
232. Sugiono M, Teber D, Anghel G, Gozen AS, Stock C, Hruza M, et al. Assessing the predictive validity and efficacy of a multimodal training programme for laparoscopic radical prostatectomy (LRP). *Eur Urol.* 2007;51:1332-1339.
233. Torgerson CS, Brydges R, Chen JM, Dubrowski A. Drilling simulated temporal bones with left-handed tools: a left-hander's right? *Ann Otol Rhinol Laryngol.* 2007;116:819-826.
234. Van Herzele I, Aggarwal R, Choong A, Brightwell R, Vermassen FE, Cheshire NJ. Virtual reality simulation objectively differentiates level of carotid stent experience in experienced interventionalists. *J Vasc Surg.* 2007;46:855-863.
235. Van Sickler KR, Ritter EM, McClusky DA, III, Lederman A, Baghai M, Gallagher AG, et al. Attempted establishment of proficiency levels for laparoscopic performance on a national scale using simulation: the results from the 2004 SAGES MIST-VR learning center study. *Surg Endosc.* 2007;21:5-10.
236. Verdaasdonk EGG, Stassen LPS, Schijven MP, Dankelman J. Construct validity and assessment of the learning curve for the SIMENDO endoscopic simulator. *Surg Endosc.* 2007;21:1406-1412.
237. Vick LR, Vick KD, Borman KR, Salameh JR. Face, content, and construct validities of inanimate intestinal anastomoses simulation. *J Surg Educ.* 2007;64:365-368.
238. Wierinck ER, Puttemans V, Swinnen SP, van Steenberghe D. Expert performance on a virtual reality simulation system. *J Dent Educ.* 2007;71:759-766.
239. Wilarsrusmee C, Lertsithichai P, Kittur DS. Vascular anastomosis model: relation between competency in a laboratory-based model and surgical competency. *Eur J Vasc Endovasc Surg.* 2007;34:405-410.
240. Woodrow SI, Dubrowski A, Khokhotva M, Backstein D, Rampersaud YR, Massicotte EM. Training and evaluating spinal surgeons: the development of novel performance measures. *Spine.* 2007;32:2921-2925.
241. Yamaguchi S, Konishi K, Yasunaga T, Yoshida D, Kinjo N, Kobayashi K, et al. Construct validity for eye-hand coordination skill on a virtual reality laparoscopic surgical simulator. *Surg Endosc.* 2007;21:2253-2257.
242. Yi SY, Woo HS, Ahn W, Kim WS, Lee DY. Clinical evaluation of the KAIST-Ewha Colonoscopy Simulator II. *Stud Health Technol Inform.* 2007;125:512-514.
243. Zirkle M, Roberson DW, Leuwer R, Dubrowski A. Using a virtual reality temporal bone simulator to assess otolaryngology trainees. *Laryngoscope.* 2007;117:258-263.
244. Zirkle M, Taplin MA, Anthony R, Dubrowski A. Objective assessment of temporal bone drilling skills. *Ann Otol Rhinol Laryngol.* 2007;116:793-798.
245. van Dongen KW, Tournoij E, van der Zee DC, Schijven MP, Broeders IAMJ. Construct validity of the LapSim: can the LapSim virtual reality simulator distinguish between novices and experts? *Surg Endosc.* 2007;21:1413-1417.

Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).

246. Andreatta PB, Woodrum DT, Gauger PG, Minter RM. LapMentor metrics possess limited construct validity. *Simul Healthc.* 2008;3:16-25.
247. Arden D, Hacker MR, Jones DB, Awtrey CS. Description and validation of the Pelv-Sim: a training model designed to improve gynecologic minimally invasive suturing skills. *J Minim Invasive Gynecol.* 2008;15:707-711.
248. Berry M, Reznick R, Lystig T, Lonn L. The use of virtual reality for training in carotid artery stenting: a construct validation study. *Acta Radiol.* 2008;49:801-805.
249. Boon JR, Salas N, Avila D, Boone TB, Lipshultz LI, Link RE. Construct validity of the pig intestine model in the simulation of laparoscopic urethrovesical anastomosis: tools for objective evaluation. *J Endourol.* 2008;22:2713-2716.
250. Botden SMBI, Berlage JTM, Schijven MP, Jakimowicz JJ. Face validity study of the ProMIS augmented reality laparoscopic suturing simulator. *Surg Technol Int.* 2008;17:26-32.
251. Botden SMBI, Buzink SN, Schijven MP, Jakimowicz JJ. ProMIS augmented reality training of laparoscopic procedures face validity. *Simul Healthc.* 2008;3:97-102.
252. Boulet JR, Murray D, Kras J, Woodhouse J. Setting performance standards for mannequin-based acute-care scenarios: an examinee-centered approach. *Simul Healthc.* 2008;3:72-81.
253. Brett-Fleegler MB, Vinci RJ, Weiner DL, Harris SK, Shih M-C, Kleinman ME. A simulator-based tool that assesses pediatric resident resuscitation competency. *Pediatrics.* 2008;121:e597-e603.
254. Brewster LP, Risucci DA, Joehl RJ, Littooy FN, Temeck BK, Blair PG, et al. Comparison of resident self-assessments with trained faculty and standardized patient assessments of clinical and technical skills in a structured educational module. *Am J Surg.* 2008;195:1-4.
255. Cesanek P, Uchal M, Uranues S, Patruno J, Gogal C, Kimmel S, et al. Do hybrid simulator-generated metrics correlate with content-valid outcome measures? *Surg Endosc.* 2008;22:2178-2183.
256. Cone SW, Rafiq A, Merrell RC. Evaluation of a documentation system for airway management training. *Simul Healthc.* 2008;3:111-115.
257. Crabtree NA, Chandra DB, Weiss ID, Joo HS, Naik VN. Fibreoptic airway training: correlation of simulator performance and clinical skill. *Can J Anaesth.* 2008;55:100-104.
258. Davoudi M, Osann K, Colt HG. Validation of two instruments to assess technical bronchoscopic skill using virtual reality simulation. *Respiration.* 2008;76:92-101.
259. Dayan AB, Ziv A, Berkenstadt H, Munz Y. A simple, low-cost platform for basic laparoscopic skills training. *Surgical Innovation.* 2008;15:136-142.
260. Egi H, Okajima M, Yoshimitsu M, Ikeda S, Miyata Y, Masugami H, et al. Objective assessment of endoscopic surgical skills by analyzing direction-dependent dexterity using the Hiroshima University Endoscopic Surgical Assessment Device (HUESAD). *Surg Today.* 2008;38:705-710.
261. Feifer A, Delisle J, Anidjar M. Hybrid augmented reality simulator: preliminary construct validation of laparoscopic smoothness in a urology residency program. *J Urol.* 2008;180:1455-1459.
262. Gettman MT, Le CQ, Rangel LJ, Slezak JM, Bergstrahl EJ, Krambeck AE. Analysis of a computer based simulator as an educational tool for cystoscopy: subjective and objective results. *J Urol.* 2008;179:267-271.
263. Glaiberman CB, Jacobs B, Street M, Duncan JR, Scerbo MW, Pilgrim TK. Simulation in training: one-year experience using an efficiency index to assess interventional radiology fellow training status. *J Vasc Interv Radiol.* 2008;19:1366-1371.
264. Gomoll AH, Pappas G, Forsythe B, Warner JJP. Individual skill progression on a virtual reality simulator for shoulder arthroscopy: a 3-year follow-up study. *Am J Sports Med.* 2008;36:1139-1142.
265. Goova MT, Hollett LA, Tesfay ST, Gala RB, Puzziferri N, Kehdy FJ, et al. Implementation, construct validity, and benefit of a proficiency-based knot-tying and suturing curriculum. *J Surg Educ.* 2008;65:309-315.
266. Guise J-M, Deering SH, Kanki BG, Osterweil P, Li H, Mori M, et al. Validation of a tool to measure and promote clinical teamwork. *Simul Healthc.* 2008;3:217-223.
267. Harders M, Bachofen D, Grassi M, Bajka M, Spaelter U, Teschner M, et al. Virtual reality based simulation of hysteroscopic interventions. *Presence: Teleoperators and Virtual Environments.* 2008;17:441-462.
268. Hatala R, Issenberg SB, Kassen B, Cole G, Bacchus CM, Scalese RJ. Assessing cardiac physical examination skills using simulation technology and real patients: a comparison study. *Med Educ.* 2008;42:628-636.
269. Howells NR, Brinsden MD, Gill RS, Carr AJ, Rees JL. Motion analysis: a validated method for showing skill levels in arthroscopy. *Arthroscopy.* 2008;24:335-342.
270. Koch AD, Buzink SN, Heemskerk J, Botden SMBI, Veenendaal R, Jakimowicz JJ, et al. Expert and construct validity of the Simbionix GI Mentor II endoscopy simulator for colonoscopy. *Surg Endosc.* 2008;22:158-162.
271. Koch AD, Haringsma J, Schoon EJ, de Man RA, Kuipers EJ. A second-generation virtual reality simulator for colonoscopy: validation and initial experience. *Endoscopy.* 2008;40:735-738.
272. Kolkman W, van de Put MAJ, Wolterbeek R, Trimbos JBMZ, Jansen FW. Laparoscopic skills simulator: construct validity and establishment of performance standards for residency training. *Gynecological Surgery.* 2008;5:109-114.

Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).

273. Lee KHK, Grantham H, Boyd R. Comparison of high- and low-fidelity mannequins for clinical performance assessment. *EMA - Emergency Medicine Australasia.* 2008;20:508-514.
274. Lendvay TS, Casale P, Sweet R, Peters C. VR robotic surgery: randomized blinded study of the dV-Trainer robotic simulator. *Stud Health Technol Inform.* 2008;132:242-244.
275. Leong JJ, Leff DR, Das A, Aggarwal R, Reilly P, Atkinson HDE, et al. Validation of orthopaedic bench models for trauma surgery. *J Bone Joint Surg Br.* 2008;90:958-965.
276. Leung RM, Leung J, Vescan A, Dubrowski A, Witterick I. Construct validation of a low-fidelity endoscopic sinus surgery simulator. *Am J Rhinol.* 2008;22:642-648.
277. Mahr MA, Hodge DO. Construct validity of anterior segment anti-tremor and forceps surgical simulator training modules: attending versus resident surgeon performance. *J Cataract Refract Surg.* 2008;34:980-985.
278. Molinas CR, De Win G, Ritter O, Keckstein J, Miserez M, Campo R. Feasibility and construct validity of a novel laparoscopic skills testing and training model. *Gynecological Surgery.* 2008;5:281-290.
279. Moore AK, Grow DR, Bush RW, Seymour NE. Novices outperform experienced laparoscopists on virtual reality laparoscopy simulator. *J Soc Laparoendosc Surg.* 2008;12:358-362.
280. Neary PC, Boyle E, Delaney CP, Senagore AJ, Keane FBV, Gallagher AG. Construct validation of a novel hybrid virtual-reality simulator for training and assessing laparoscopic colectomy; results from the first course for experienced senior laparoscopic surgeons. *Surg Endosc.* 2008;22:2301-2309.
281. Noh Y, Segawa M, Shimomura A, Ishii H, Solis J, Hatake K, et al. WKA-1R robot assisted quantitative assessment of airway management. *Int J Comput Assist Radiol Surg.* 2008;3:543-550.
282. Saleh GM, Gauba V, Sim D, Lindfield D, Borhani M, Ghousayni S. Motion analysis as a tool for the evaluation of oculoplastic surgical skill: evaluation of oculoplastic surgical skill. *Arch Ophthalmol.* 2008;126:213-216.
283. Sevdalis N, Davis R, Koutantji M, Undre S, Darzi A, Vincent CA. Reliability of a revised NOTECHS scale for use in surgical teams. *Am J Surg.* 2008;196:184-190.
284. Sewell C, Morris D, Blevins NH, Dutta S, Agrawal S, Barbagli F, et al. Providing metrics and performance feedback in a surgical simulator. *Comput Aided Surg.* 2008;13:63-81.
285. Siddiqui NY, Stepp KJ, Lasch SJ, Mangel JM, Wu JM. Objective structured assessment of technical skills for repair of fourth-degree perineal lacerations. *Am J Obstet Gynecol.* 2008;199:e671-e.676.
286. Todd M, Manz JA, Hawkins KS, Parsons ME, Hercinger M. The development of a quantitative evaluation tool for simulations in nursing education. *International Journal of Nursing Education Scholarship.* 2008;5:Article 41.
287. Tzafestas CS, Birbas K, Koumpouros Y, Christopoulos D. Pilot evaluation study of a virtual paracentesis simulator for skill training and assessment: the beneficial effect of haptic display. *Presence: Teleoperators and Virtual Environments.* 2008;17:212-229.
288. Van Herzele I, Aggarwal R, Neequaye S, Darzi A, Vermassen F, Cheshire NJ. Cognitive training improves clinically relevant outcomes during simulated endovascular procedures. *J Vasc Surg.* 2008;48:1223-1230.
289. Van Sickle KR, Baghai M, Huang I-P, Goldenberg A, Smith CD, Ritter EM. Construct validity of an objective assessment method for laparoscopic intracorporeal suturing and knot tying. *Am J Surg.* 2008;196:74-80.
290. Zhang A, Hunerbein M, Dai Y, Schlag PM, Beller S. Construct validity testing of a laparoscopic surgery simulator (Lap Mentor®): evaluation of surgical skill with a virtual laparoscopic training simulator. *Surg Endosc.* 2008;22:1440-1444.
291. Zheng B, Denk PM, Martinec DV, Gatta P, Whiteford MH, Swanstrom LL. Building an efficient surgical team using a bench model simulation: construct validity of the Legacy Inanimate System for Endoscopic Team Training (LISETT). *Surg Endosc.* 2008;22:930-937.
292. Adler MD, Vozenilek JA, Trainor JL, Eppich WJ, Wang EE, Beaumont JL, et al. Development and evaluation of a simulation-based pediatric emergency medicine curriculum. *Acad Med.* 2009;84:935-941.
293. Arnold JJ, Johnson LM, Tucker SJ, Malec JF, Henrickson SE, Dunn WF. Evaluation tools in simulation learning: performance and self-efficacy in emergency response. *Clinical Simulation in Nursing.* 2009;5:e35-e43.
294. Balkissoon R, Blossfield K, Salud L, Ford D, Pugh C. Lost in translation: unfolding medical students' misconceptions of how to perform a clinical digital rectal examination. *Am J Surg.* 2009;197:525-532.
295. Botden SMBI, de Hingh IHJT, Jakimowicz JJ. Meaningful assessment method for laparoscopic suturing training in augmented reality. *Surg Endosc.* 2009;23:2221-2228.
296. Brydges R, Carnahan H, Dubrowski A. Assessing suturing skills in a self-guided learning setting: absolute symmetry error. *Adv Health Sci Educ Theory Pract.* 2009;14:685-695.
297. Buzink SN, Botden SMBI, Heemskerk J, Goossens RHM, de Ridder H, Jakimowicz JJ. Camera navigation and tissue manipulation; are these laparoscopic skills related? *Surg Endosc.* 2009;23:750-757.
298. Carroll SM, Kennedy AM, Traynor O, Gallagher AG. Objective assessment of surgical performance and its impact on a national selection programme of candidates for higher surgical training in plastic surgery. *J Plast Reconstr Aesthet Surg.* 2009;62:1543-1549.
299. Chipman JG, Schmitz CC. Using objective structured assessment of technical skills to evaluate a basic skills simulation curriculum for first-year surgical residents. *J Am Coll Surg.* 2009;209:364-370.e362.

Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).

300. Contag SP, Klein AM, Blount AC, Johns MM, III. Validation of a laryngeal dissection module for phonemicrosurgical training. *Laryngoscope.* 2009;119:211-215.
301. Dolmans VEMG, Schout BMA, de Beer NAM, Bemelmans BLH, Scherbier AJJA, Hendrikx AJM. The virtual reality endourologic simulator is realistic and useful for educational purposes. *J Endourol.* 2009;23:1175-1181.
302. Hatala R, Scalese RJ, Cole G, Bacchus M, Kassen B, Issenberg SB. Development and validation of a cardiac findings checklist for use with simulator-based assessments of cardiac physical examination competence. *Simul Healthc.* 2009;4:17-21.
303. Haycock AV, Bassett P, Bladen J, Thomas-Gibson S. Validation of the second-generation Olympus colonoscopy simulator for skills assessment. *Endoscopy.* 2009;41:952-958.
304. Henrichs BM, Avidan MS, Murray DJ, Boulet JR, Kras J, Krause B, et al. Performance of certified registered nurse anesthetists and anesthesiologists in a simulation-based skills assessment. *Anesth Analg.* 2009;108:255-262.
305. Huang GC, Newman LR, Schwartzstein RM, Clardy PF, Feller-Kopman D, Irish JT, et al. Procedural competence in internal medicine residents: validity of a central venous catheter insertion assessment instrument. *Acad Med.* 2009;84:1127-1134.
306. Insel A, Carofino B, Leger R, Arciero R, Mazzocca AD. The development of an objective model to assess arthroscopic performance. *Journal of Bone and Joint Surgery American Volume.* 2009;91:2287-2295.
307. Kenney PA, Wszolek MF, Gould JJ, Libertino JA, Moinzadeh A. Face, content, and construct validity of dV-trainer, a novel virtual reality simulator for robotic surgery. *Urology.* 2009;73:1288-1292.
308. Kim J, Neilipovitz D, Cardinal P, Chiu M. A comparison of global rating scale and checklist scores in the validation of an evaluation tool to assess performance in the resuscitation of critically ill patients during simulated emergencies. *Simul Healthc.* 2009;4:6-16.
309. Kolesnikov M, Žefran M, Steinberg AD, Bashook PG. PerioSim: Haptic virtual reality simulator for sensorimotor skill acquisition in dentistry. *Proceedings IEEE International Conference on Robotics and Automation.* 2009;Article number 5152751:689-694.
310. Kundhal PS, Grantcharov TP. Psychomotor performance measured in a virtual environment correlates with technical skills in the operating room. *Surg Endosc.* 2009;23:645-649.
311. Kössi J, Luostarinen M. Virtual reality laparoscopic simulator as an aid in surgical resident education: Two years' experience. *Scandinavian Journal of Surgery.* 2009;98:48-54.
312. Langley RGB, Tyler SA, Ornstein AE, Sutherland AE, Mosher LM. Temporary tattoos to simulate skin disease: report and validation of a novel teaching tool. *Acad Med.* 2009;84:950-953.
313. LeBlanc VR, Tabak D, Kneebone R, Nestel D, MacRae H, Moulton C-A. Psychometric properties of an integrated assessment of technical and communication skills. *Am J Surg.* 2009;197:96-101.
314. Napier F, Davies RP, Baldock C, Stevens H, Lockey AS, Bullock I, et al. Validation for a scoring system of the ALS cardiac arrest simulation test (CASTest). *Resuscitation.* 2009;80:1034-1038.
315. Pellen M, Horgan L, Barton JR, Attwood S. Laparoscopic surgical skills assessment: can simulators replace experts? *World J Surg.* 2009;33:440-447.
316. Pellen MG, Horgan LF, Barton JR, Attwood SE. Construct validity of the ProMIS laparoscopic simulator. *Surg Endosc.* 2009;23:130-139.
317. Phitayakorn R, Marks JM, Reynolds HL, Delaney CP. Expert benchmark for the GI Mentor II™. *Surg Endosc.* 2009;23:611-614.
318. Powers K, Rehrig ST, Schwartzberg SD, Callery MP, Jones DB. Seasoned surgeons assessed in a laparoscopic surgical crisis. *J Gastrointest Surg.* 2009;13:994-1003.
319. Reiley CE, Hager GD. Task versus subtask surgical skill evaluation of robotic minimally invasive surgery. *Med Image Comput Comput Assist Interv Int Conf Med Image Comput Comput Assist Interv.* 2009;12 (Pt 1):435-442.
320. Saleh GM, Lindfield D, Sim D, Tsesmetzoglou E, Gauba V, Gartry DS, et al. Kinematic analysis of surgical dexterity in intraocular surgery. *Arch Ophthalmol.* 2009;127:758-762.
321. Salgado J, Grantcharov TP, Papasavvas PK, Gagne DJ, Caushaj PF. Technical skills assessment as part of the selection process for a fellowship in minimally invasive surgery. *Surg Endosc.* 2009;23:641-644.
322. Sankaranarayanan G, Arikatla S, Lin H, Jones D, De S. Face validation of the virtual basic laparoscopic skill trainer (VBLaST™). *Stud Health Technol Inform.* 2009;142:286-288.
323. Sansregret A, Fried GM, Hasson H, Klassen D, Lagace M, Gagnon R, et al. Choosing the right physical laparoscopic simulator? Comparison of LTS2000-ISM60 with MISTELS: validation, correlation, and user satisfaction. *Am J Surg.* 2009;197:258-265.
324. Schout BMA, Bemelmans BLH, Martens EJ, Scherbier AJJA, Hendrikx AJM. How useful and realistic is the Uro Trainer for training transurethral prostate and bladder tumor resection procedures? *J Urol.* 2009;181:1297-1303.
325. Schreuder HW, van Dongen KW, Roeleveld SJ, Schijven MP, Broeders IAMJ. Face and construct validity of virtual reality simulation of laparoscopic gynecologic surgery. *Am J Obstet Gynecol.* 2009;200:e541-e548.
326. Sethi AS, Peine WJ, Mohammadi Y, Sundaram CP. Validation of a novel virtual reality robotic simulator. *J Endourol.* 2009;23:503-508.

Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).

327. Sevdalis N, Undre S, Henry J, Sydney E, Koutantji M, Darzi A, et al. Development, initial reliability and validity testing of an observational tool for assessing technical skills of operating room nurses. *Int J Nurs Stud.* 2009;46:1187-1193.
328. Shippey S, Handa VL, Chen TL, Chou B, Bowen CW. Validation of an instrument for evaluation of subcuticular suturing using a plastic tissue model. *J Surg Educ.* 2009;66:31-34.
329. Solverson DJ, Mazzoli RA, Raymond WR, Nelson ML, Hansen EA, Torres MF, et al. Virtual reality simulation in acquiring and differentiating basic ophthalmic microsurgical skills. *Simul Healthc.* 2009;4:98-103.
330. Stefanidis D, Scott DJ, Korndorffer JR, Jr. Do metrics matter? Time versus motion tracking for performance assessment of proficiency-based laparoscopic skills training. *Simul Healthc.* 2009;4:104-108.
331. Suebnukarn S, Phatthanasantiankul N, Sombatweroje S, Rhienmora P, Haddawy P. Process and outcome measures of expert/novice performance on a haptic virtual reality system. *J Dent.* 2009;37:658-665.
332. Tashiro Y, Miura H, Nakanishi Y, Okazaki K, Iwamoto Y. Evaluation of skills in arthroscopic training based on trajectory and force data. *Clin Orthop.* 2009;467:546-552.
333. Van Herzele I, Aggarwal R, Malik I, Gaines P, Hamady M, Darzi A, et al. Validation of Video-based Skill Assessment in Carotid Artery Stenting. *Eur J Vasc Endovasc Surg.* 2009;38:1-9.
334. Volsky PG, Hughley BB, Peirce SM, Kesser BW. Construct validity of a simulator for myringotomy with ventilation tube insertion. *Otolaryngol Head Neck Surg.* 2009;141:603-608.e601.
335. Waldrop WB, Murray DJ, Boulet JR, Kras JF. Management of anesthesia equipment failure: a simulation-based resident skill assessment. *Anesth Analg.* 2009;109:426-433.
336. Weeks DL, Molsberry DM. Feasibility and reliability of remote assessment of PALS psychomotor skills via interactive videoconferencing. *Resuscitation.* 2009;80:354-358.
337. Weidenbach M, Razek V, Wild F, Khambadkone S, Berlage T, Janousek J, et al. Simulation of congenital heart defects: a novel way of training in echocardiography. *Heart.* 2009;95:636-641.
338. Willems MCM, van der Vliet JA, Williams V, Schultze Kool LJ, Bergqvist D, Blankensteijn JD. Assessing endovascular skills using the Simulator for Testing and Rating Endovascular Skills (STRESS) machine. *Eur J Vasc Endovasc Surg.* 2009;37:431-436.
339. Williams JB, McDonough MA, Hilliard MW, Williams AL, Cuniowski PC, Gonzalez MG. Intermethod reliability of real-time versus delayed videotaped evaluation of a high-fidelity medical simulation septic shock scenario. *Acad Emerg Med.* 2009;16:887-893.
340. Willoteaux S, Lions C, Duhamel A, Vernhet H, Sapoval M, Boyer L, et al. Virtual interventional radiology: evaluation of performances as a function of experience. *J Radiol.* 2009;90:37-41.
341. Wright MC, Phillips-Bute BG, Petrusa ER, Griffin KL, Hobbs GW, Taekman JM. Assessing teamwork in medical education and practice: relating behavioural teamwork ratings and clinical performance. *Med Teach.* 2009;31:30-38.
342. Xeroulis G, Dubrowski A, Leslie K. Simulation in laparoscopic surgery: A concurrent validity study for FLS. *Surg Endosc.* 2009;23:161-165.
343. von Delius S, Thies P, Meining A, Wagenpfeil S, Burian M, Huber W, et al. Validation of the X-Vision ERCP Training System and technical challenges during early training of sphincterotomy. *Clin Gastroenterol Hepatol.* 2009;7:389-396.
344. von Wyl T, Zuercher M, Amsler F, Walter B, Ummenhofer W. Technical and non-technical skills can be reliably assessed during paramedic simulation training. *Acta Anaesthesiol Scand.* 2009;53:121-127.
345. Allen B, Nistor V, Dutson E, Carman G, Lewis C, Faloutsos P. Support vector machines improve the accuracy of evaluation for the performance of laparoscopic training tasks. *Surg Endosc.* 2010;24:170-178.
346. Bajka M, Tuchschmid S, Fink D, Szekely G, Harders M. Establishing construct validity of a virtual-reality training simulator for hysteroscopy via a multimetric scoring system. *Surg Endosc.* 2010;24:79-88.
347. Berger P, Willems MCM, Van Der Vliet JA, Schultze Kool LJ, Bergqvist D, Blankensteijn JD. Validation of the Simulator for Testing and Rating Endovascular Skills (STRESS)-machine in a setting of competence testing. *J Cardiovasc Surg (Torino).* 2010;51:253-256.
348. Bittner JG, IV, Mellinger JD, Imam T, Schade RR, MacFadyen BV, Jr. Face and construct validity of a computer-based virtual reality simulator for ERCP. *Gastrointest Endosc.* 2010;71:357-364.
349. Black SA, Nestel DF, Kneebone RL, Wolfe JHN. Assessment of surgical competence at carotid endarterectomy under local anaesthesia in a simulated operating theatre. *Br J Surg.* 2010;97:511-516.
350. Brewin J, Nedas T, Challacombe B, Elhage O, Keisu J, Dasgupta P. Face, content and construct validation of the first virtual reality laparoscopic nephrectomy simulator. *BJU Int.* 2010;106:850-854.
351. Campo R, Reising C, Van Belle Y, Nassif J, O'Donovan P, Molinas CR. A valid model for testing and training laparoscopic psychomotor skills. *Gynecological Surgery.* 2010;7:133 -141
352. Casabella Abril B, Lacasta Tintorer D, Clusa Gironella T, Perelló Bratescu A, García Ortega MD, Albiach Pla A, et al. Test to measure basic life support and defibrillation skills in primary care doctors and nurses [Spanish]. *Aten Primaria.* 2010;42:7-13.

- Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).
353. Chandra V, Nehra D, Parent R, Woo R, Reyes R, Hernandez-Boussard T, et al. A comparison of laparoscopic and robotic assisted suturing performance by experts and novices. *Surgery.* 2010;147:830-839.
354. Coates PJB, Zealley IA, Chakraverty S. Endovascular simulator is of benefit in the acquisition of basic skills by novice operators. *J Vasc Interv Radiol.* 2010;21:130-134.
355. Cooper S, Cant R, Porter J, Sellick K, Somers G, Kinsman L, et al. Rating medical emergency teamwork performance: Development of the Team Emergency Assessment Measure (TEAM). *Resuscitation.* 2010;81:446-452.
356. Dong Y, Suri HS, Cook DA, Kashani KB, Mullon JJ, Enders FT, et al. Simulation-based objective assessment discerns clinical proficiency in central line placement: a construct validation. *Chest.* 2010;137:1050-1056.
357. Donoghue A, Nishisaki A, Sutton R, Hales R, Boulet J. Reliability and validity of a scoring instrument for clinical performance during Pediatric Advanced Life Support simulation scenarios. *Resuscitation.* 2010;81:331-336.
358. Egi H, Okajima M, Kawahara T, Yoshimitsu M, Sumitani D, Tokunaga M, et al. Scientific assessment of endoscopic surgical skills. *Minim Invasive Ther Allied Technol.* 2010;19:30-34.
359. Fayed R, Feldman LS, Kaneva P, Fried GM. Testing the construct validity of the Simbionix GI Mentor II virtual reality colonoscopy simulator metrics: module matters. *Surg Endosc.* 2010;24:1060-1065.
360. Fero LJ, O'Donnell JM, Zullo TG, Dabbs AD, Kitutu J, Samosky JT, et al. Critical thinking skills in nursing students: comparison of simulation-based performance with metrics. *J Adv Nurs.* 2010;66:2182-2193.
361. Fransson BA, Ragle CA. Assessment of laparoscopic skills before and after simulation training with a canine abdominal model. *J Am Vet Med Assoc.* 2010;236:1079-1084.
362. Gale TCE, Roberts MJ, Sice PJ, Langton JA, Patterson FC, Carr AS, et al. Predictive validity of a selection centre testing non-technical skills for recruitment to training in anaesthesia. *Br J Anaesth.* 2010;105:603-609.
363. Gordon JA, Alexander EK, Lockley SW, Flynn-Evans E, Venkatan SK, Landigan CP, et al. Does simulator-based clinical performance correlate with actual hospital behavior? The effect of extended work hours on patient care provided by medical interns. *Acad Med.* 2010;85:1583-1588.
364. Grayeli AB, Bernardeschi D, Sonji G, Elgarem H, Sterkers O, Ferrary E. Assessing mental representation of mastoidectomy by a computer-based drawing tool. *Acta Otolaryngol (Stockh).* 2010;130:1335-1342.
365. Greco EF, Regehr G, Okrainec A. Identifying and classifying problem areas in laparoscopic skills acquisition: Can simulators help? *Acad Med.* 2010;85 (10 SUPPL):S5-S8
366. Grone J, Lauscher JC, Buhr HJ, Ritz J-P. Face, content and construct validity of a new realistic trainer for conventional techniques in digestive surgery. *Langenbecks Arch Surg.* 2010;395:581-588.
367. Hudak SJ, Landt CL, Hernandez J, Soderdahl DW. External validation of a virtual reality transurethral resection of the prostate simulator. *J Urol.* 2010;184:2018-2022.
368. Ishman SL, Brown DJ, Boss EF, Skinner ML, Tunkel DE, Stavinoha R, et al. Development and pilot testing of an operative competency assessment tool for pediatric direct laryngoscopy and rigid bronchoscopy. *Laryngoscope.* 2010;120:2294-2300.
369. Kallstrom R, Hjertberg H, Svanvik J. Construct validity of a full procedure, virtual reality, real-time, simulation model for training in transurethral resection of the prostate. *J Endourol.* 2010;24:109-115.
370. Kazemi H, Rappel JK, Poston T, Lim BH, Burdet E, Teo CL. Assessing suturing techniques using a virtual reality surgical simulator. *Microsurgery.* 2010;30:479-486.
371. Kim S, Spencer G, Makar GA, Ahmad NA, Jaffe DL, Ginsberg GG, et al. Lack of a discriminatory function for endoscopy skills on a computer-based simulator. *Surg Endosc.* 2010;24:3008-3015.
372. Mishra S, Kurien A, Ganpule A, Muthu V, Sabnis R, Desai M. Percutaneous renal access training: content validation comparison between a live porcine and a virtual reality (VR) simulation model. *BJU Int.* 2010;106:1753-1756.
373. Mishra S, Kurien A, Ganpule A, Veeramani M, Sabnis RB, Desai M. Face and content validity of transurethral resection of prostate on Uro Trainer: is the simulation training useful? *J Endourol.* 2010;24:1839-1843.
374. Mishra S, Kurien A, Patel R, Patil P, Ganpule A, Muthu V, et al. Validation of virtual reality simulation for percutaneous renal access training. *J Endourol.* 2010;24:635-640.
375. Musacchio MJ, Jr, Smith AP, McNeal CA, Munoz L, Rothenberg DM, von Roenn KA, et al. Neuro-critical care skills training using a human patient simulator. *Neurocritical Care.* 2010;13:169-175.
376. Nunnink L, Venkatesh B, Krishnan A, Vidhani K, Udy A. A prospective comparison between written examination and either simulation-based or oral viva examination of intensive care trainees' procedural skills. *Anaesth Intensive Care.* 2010;38:876-882.
377. Park CS, Rochlen LR, Yaghmour E, Higgins N, Bauchat JR, Wojciechowski KG, et al. Acquisition of critical intraoperative event management skills in novice anesthesiology residents by using high-fidelity simulation-based training. *Anesthesiology.* 2010;112:202-211.
378. Paskins Z, Kirkcaldy J, Allen M, Macdougall C, Fraser I, Peile E. Design, validation and dissemination of an undergraduate assessment tool using SimMan® in simulated medical emergencies. *Med Teach.* 2010;32:e12-e17.
379. Perosky J, Richter R, Rybak O, Gans-Larty F, Mensah MA, Danquah A, et al. A low-cost simulator for learning to manage postpartum hemorrhage in rural Africa. *Simul Healthc.* 2010;6:42-47.

- Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).
380. Privett B, Greenlee E, Rogers G, Oetting TA. Construct validity of a surgical simulator as a valid model for capsulorhexis training. *J Cataract Refract Surg.* 2010;36:1835-1838.
 381. Rueseler M, Weinlich M, Byhahn C, Muller MP, Junger J, Marzi I, et al. Increased authenticity in practical assessment using emergency case OSCE stations. *Adv Health Sci Educ Theory Pract.* 2010;15:81-95.
 382. Sanchez-Peralta LF, Sanchez-Margallo FM, Moyano-Cuevas JL, Pagador JB, Enciso-Sanz S, Sanchez-Gonzalez P, et al. Construct and face validity of SINERGIA laparoscopic virtual reality simulator. *Int J CARS.* 2010;5:307-315.
 383. Sankaranarayanan G, Lin H, Arikatla VS, Mulcare M, Zhang L, Derevianko A, et al. Preliminary face and construct validation study of a virtual basic laparoscopic skill trainer. *J Laparoendosc Adv Surg Tech A.* 2010;20:153-157.
 384. Sarker SK, Albrani T, Zaman A, Kumar I. Procedural performance in gastrointestinal endoscopy: live and simulated. *World Journal of Surgery.* 2010;34:1764-1770.
 385. Sarker SK, Maciocca M, Zaman A, Kumar I. Operative performance in laparoscopic cholecystectomy using the Procedural-Based Assessment tool. *Am J Surg.* 2010;200:334-340.
 386. Schout BMA, Muijtjens AMM, Hendrikx AJM, Ananias HJK, Dolmans VEMG, Scherpelbier AJJA, et al. Acquisition of flexible cystoscopy skills on a virtual reality simulator by experts and novices. *BJU Int.* 2010;105:234-239.
 387. Seixas-Mikelus SA, Kesavadas T, Srimathveeravalli G, Chandrasekhar R, Wilding GE, Guru KA. Face validation of a novel robotic surgical simulator. *Urology.* 2010;76:357-360.
 388. Serrano-Martínez P, Nava-García JA, Rodríguez-García A, Páez-Garza JH. Evaluation of the development of surgical abilities and skills of residents and instructors of cataract surgery using the eye surgery simulator EyeSi® [Spanish]. *Revista Mexicana de Oftalmología.* 2010;84:19-24.
 389. Stewart CM, Masood H, Pandian V, Laeeq K, Akst L, Francis HW, et al. Development and pilot testing of an objective structured clinical examination (OSCE) on hoarseness. *Laryngoscope.* 2010;120:2177-2182.
 390. Stovall BA, Bae S, Kumar S. Anterior superior iliac spine asymmetry assessment on a novel pelvic model: an investigation of accuracy and reliability. *J Manipulative Physiol Ther.* 2010;33:378-385.
 391. Tuchschmid S, Bajka M, Harders M. Comparing automatic simulator assessment with expert assessment of virtual surgical procedures. In: Bello F, Cotin S, editors. *Lecture Notes in Computer Science.* Berlin Heidelberg: Springer-Verlag; 2010. p. 181-191.
 392. Tuijthof GJM, van Sterkenburg MN, Sierevelt IN, van Oldenrijk J, Van Dijk CN, Kerkhoffs GMMJ. First validation of the PASSPORT training environment for arthroscopic skills. *Knee Surg Sports Traumatol Arthrosc.* 2010;18:218-224.
 393. White MA, DeHaan AP, Stephens DD, Maes AA, Maatman TJ. Validation of a high fidelity adult ureteroscopy and renoscopy simulator. *J Urol.* 2010;183:673-677.
 394. Wijn RPWF, Persoon MC, Schout BMA, Martens EJ, Scherpelbier AJJA, Hendrikx AJM. Virtual reality laparoscopic nephrectomy simulator is lacking in construct validity. *J Endourol.* 2010;24:117-122.
 395. Wilson M, McGrath J, Vine S, Brewer J, Defriend D, Masters R. Psychomotor control in a virtual laparoscopic surgery training environment: gaze control parameters differentiate novices from experts. *Surg Endosc.* 2010;24:2458-2464.
 396. Wohaibi EM, Bush RW, Earle DB, Seymour NE. Surgical resident performance on a virtual reality simulator correlates with operating room performance. *J Surg Res.* 2010;160:67-72.
 397. Yurko YY, Scerbo MW, Prabhu AS, Acker CE, Stefanidis D. Higher mental workload is associated with poorer laparoscopic performance as measured by the NASA-TLX tool. *Simul Healthc.* 2010;5:267-271.
 398. Zhang Q, Li B. Towards computational understanding of skill levels in simulation-based surgical training via automatic video analysis. In: Bebis G, Boyle RD, Parvin B, Koracin D, Chung R, Hammoud RI, et al., editors. *Lecture Notes in Computer Science.* Berlin Heidelberg: Springer-Verlag; 2010. p. 249-260.
 399. Zheng B, Hur H-C, Johnson S, Swanström LL. Validity of using Fundamentals of Laparoscopic Surgery (FLS) program to assess laparoscopic competence for gynecologists. *Surg Endosc.* 2010;24:152-160.
 400. Adler MD, Vozenilek JA, Trainor JL, Eppich WJ, Wang EE, Beaumont JL, et al. Comparison of checklist and anchored global rating instruments for performance rating of simulated pediatric emergencies. *Simul Healthc.* 2011;6:18-24.
 401. Ghaderi I, Vaillancourt M, Sroka G, Kaneva PA, Seagull FJ, George I, et al. Performance of simulated laparoscopic incisional hernia repair correlates with operating room performance. *Am J Surg.* 2011;201:40-45.
 402. Isenberg GA, Berg KW, Veloski JA, Berg DD, Veloski JJ, Yeo CJ. Evaluation of the use of patient-focused simulation for student assessment in a surgery clerkship. *Am J Surg.* 2011;201:835-840.
 403. Iwata N, Fujiwara M, Kodera Y, Tanaka C, Ohashi N, Nakayama G, et al. Construct validity of the LapVR virtual-reality surgical simulator. *Surg Endosc.* 2011;25:423-428.
 404. Jayaraman S, Trejos AL, Naish MD, Lyle A, Patel RV, Schlachta CM. Toward construct validity for a novel sensorized instrument-based minimally invasive surgery simulation system. *Surg Endosc.* 2011;25:1439-1445.
 405. Kurashima Y, Feldman LS, Al-Sabah S, Kaneva PA, Fried GM, Vassiliou MC. A tool for training and evaluation of laparoscopic inguinal hernia repair: the Global Operative Assessment of Laparoscopic Skills-Groin Hernia (GOALS-GH). *Am J Surg.* 2011;201:54-61.

Supplemental digital content for Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Technology-enhanced simulation to assess health professionals: A systematic review of validity evidence, research methods, and reporting quality. *Acad Med.* 2013;88(6).

406. Le TDB, Adatia FA, Lam W-C. Virtual reality ophthalmic surgical simulation as a feasible training and assessment tool: results of a multicentre study. *Can J Ophthalmol.* 2011;46:56-60.
407. Nathoo N, Ng M, Ramstead CL, Johnson MC. Comparing performance of junior and senior ophthalmology residents on an intraocular surgical simulator. *Can J Ophthalmol.* 2011;46:87-88.
408. Salud LH, Peniche AR, Salud JC, De Hoyos AL, Pugh CM. Toward a simulation and assessment method for the practice of camera-guided rigid bronchoscopy. *Stud Health Technol Inform.* 2011;163:535-541.
409. Sankaranarayanan G, Adair JD, Halic T, Gromski MA, Lu Z, Ahn W, et al. Validation of a novel laparoscopic adjustable gastric band simulator. *Surg Endosc.* 2011;25:1012-1018.
410. Seixas-Mikelus SA, Stegemann AP, Kesavadas T, Srimathveeravalli G, Sathyaseelan G, Chandrasekhar R, et al. Content validation of a novel robotic surgical simulator. *BJU Int.* 2011;107:1130-1135.
411. Soderberg P, Erngrund M, Skarman E, Nordh L, Laurell C-G. VR-simulation cataract surgery in non-experienced trainees, evolution of surgical skill. Paper presented at: Ophthalmic Technologies XXI2011; San Francisco, CA.
412. Stather DR, MacEachern P, Rimmer K, Hergott CA, Tremblay A. Validation of an endobronchial ultrasound simulator: Differentiating operator skill level. *Respiration.* 2011;81:325-332.
413. Strickland A, Fairhurst K, Lauder C, Hewett P, Maddern G. Development of an ex vivo simulated training model for laparoscopic liver resection. *Surg Endosc.* 2011;25:1677-1682.
414. Vaillancourt M, Ghaderi I, Kaneva P, Vassiliou M, Kolozsvari N, George I, et al. GOALS-incisional hernia: A valid assessment of simulated laparoscopic incisional hernia repair. *Surgical Innovation.* 2011;18:48-54.
415. Weller J, Frengley R, Torrie J, Shulruf B, Jolly B, Hopley L, et al. Evaluation of an instrument to measure teamwork in multidisciplinary critical care teams. *BMJ Quality and Safety.* 2011;20:216-222.
416. Fitzpatrick M, Ta A, Lenchus J, Arheart KL, Rosen LF, Birnbach DJ. Sexual assault forensic examiners' training and assessment using simulation technology. *J Emerg Nurs.* 2012;38:85-90.
417. O'Donnell JM, Goode JS, Henker RA, Kelsey S, Bircher N, Peele P, et al. An ergonomic protocol for patient transfer that can be successfully taught using simulation methods. *Clinical Simulation in Nursing.* 2012;8:e3-e14.

Supplemental Digital Table 1

List of all included studies, sorted by year of publication, with validity evidence and QUADAS-2 ratings (N=417 except for QUADAS-2)

Author, year	Topic	Coded instrument	Other instrument	N	Trainee class	Outcomes	Validity Evidence					QUADAS-2 (N=217)							
							Content	Resp Proc	Internal structure	Relations other var.	Conseq.	Reliability	MERSQI	Full	Selection	Flow	Index RoB	Index Appl	Ref RoB
Mancini ME (1990) ¹	Resusc	Checklist	Computer	48	PG, RN	SPc			M				12.5	N					
Rubens AJ (1991) ²	Airway, Resusc	Computer	Counts	22	MD, RN, EMT	SPd			M				11.5	N					
Berden HJ (1992) ³	Resusc	GRS		40	RN	R, SPc	C						11.5	N					
Pippin DJ (1992) ⁴	Dentist	Single item		0	D	SPd			IS			R	10.5	N					
Chapman DM (1994) ⁵	Open surg	Counts	Time	18	MS, PG, MD	K, ST, SPc	C	IS	M,T		C	15.5	Y	H	L	U	L	U	H
Chapman DM (1996) ⁶	Open surg	Counts	Time	18	MS, PG, MD	K, ST, SPc	C	IS	M,T		C	15.5	Y	H	L	H	L	U	H
Faulkner H (1996) ⁷	Open surg	OSATS		12	PG	SPc, BP			M				13.5	N					
Nahigian E (1996) ⁸	Resusc	Checklist	Other	89	A	SPc	C		M				12.5	Y	H	L	U	L	L
Byrne AJ (1997) ⁹	Anesth	Time	Counts	20	MD	ST, SPc			T				11.5	N					
Devitt JH (1997) ¹⁰	Anesth	GRS		6	MD	SPc			IS			R	11.5	N					
Jansen JJ (1997) ¹¹	Resusc	GRS	Single item, Checklist	71	MD	SPc	C	IS	M,T		R	15.5	Y	U	L	U	L	L	L
Martin JA (1997) ¹²	Open surg	OSATS		20	PG	SPc	C	IS	M,T		C, R	14	Y	H	L	H	L	H	L
Reznick R (1997) ¹³	Open surg	OSATS		48	PG	SPc	C	IS	T		C	13.5	Y	H	L	H	L		
Chalabian J (1998) ¹⁴	Exam, Nontech	Counts		68	PG	K, SPc, SPd	C	IS	M		C	15	Y	U	L	L	U	L	
Chung JY (1998) ¹⁵	MIS.	Time		16	PG	ST			T				13	N					
Derossis AM (1998) ¹⁶	MIS.	MISTELS		42	PG, MD	SPc			T				11	N					
Devitt JH (1998) ¹⁷	Anesth	GRS		25	PG, MD	SPc			IS	T		IC	14.5	Y	H	H	H	L	
Gaba DM (1998) ¹⁸	Anesth, Nontech	GRS	Single item, Checklist	72	PG, MD, RN	SPc	C	IS	M		R	14.5	Y	H	L	L	U	L	
Regehr G (1998) ¹⁹	Open surg	OSATS	GRS	53	PG	SPc, SPd			M,T			C	13	Y	H	U	H	L	L
Taffinder N (1998) ²⁰	MIS.	MIST-VR		30	PG, MD, A	ST, SPc			T				11.5	N					
Fried GM (1999) ²¹	MIS.	Other:composite (pig)	MISTELS, Time, Counts	12	PG	SPc			M				13.5	N					
Macmillan AI (1999) ²²	MIS.	Advanced Dundee Endoscopic Psychomotor Tester		10	PG	SPc, SPd, BP			M,T				12.5	Y	H	L	L	H	H
McCarthy A (1999) ²³	MIS.	Sheffield Knee Arthroscopy Training System		22	PG, MD, A	R, ST, SPc	C		T				9.5	Y	H	U	L	H	
O'Toole RV (1999) ²⁴	Open surg	Computer	Time	20	MS, MD	ST, SPc	C		T				14	Y	H	L	L	L	
Prystowsky JB (1999) ²⁵	Venous	Computer		60	MS, PG	R, ST, SPc, SPd			M,T				12	Y	H	L	L	H	L
Smith S (1999) ²⁶	MIS.	Procedicus Virtual Arthroscopy		18	MS, MD	ST, SPc	C		T				11.5	Y	H	U	L	H	
Graham CA (2000) ²⁷	Resusc	GRS		87	D, A	SPc	C		T				11	Y	U	L	H	L	
Morgan PJ (2000) ²⁸	Anesth	Other:faculty ratings NOS		24	MS	R, K, SPc, BP			IS	M		R	13.5	Y	L	L	U	L	H
Richards C (2000) ²⁹	MIS.	Computer		10	A	SPc			T				10.5	N					
Szalay D (2000) ³⁰	Open surg	GRS	OSATS, Time	20	PG	ST, SPc, SPd, BP		RP	IS	M,T		C, R	14.5	Y	U	L	L	L	L
Ault G (2001) ³¹	Open surg	OSATS		77	PG	SPc			IS	T		C	12.5	Y	H	U	U	L	
Datta V (2001) ³²	Open surg	ICSAD		51	PG, MD	ST, SPc	C		M,T				11.5	Y	U	U	L	L	L

Author, year	Topic	Coded instrument	Other instrument	N	Trainee class	Outcomes	Validity Evidence					QUADAS-2 (N=217)							
							Content	Resp Proc	Internal structure	Relations	other var.	Conseq.	Reliability	MERSQI	Full	Selection	Flow	Index RoB	Index Appl
Devitt JH (2001) ³³	Anesth	GRS		142	MS, PG, MD	R, SPc	C	IS	T		IC	14.5	Y	H	L	H	L		
Friedlich M (2001) ³⁴	Open surg	OSATS		47	PG	SPc	C	IS	T		C, R	13.5	Y	H	L	U	L		
Goff BA (2001) ³⁵	MIS., Open surg	OSATS	Time	24	PG	ST, SPc	C	IS	M,T		IC, R	13.5	Y	L	L	H	L	H	L
Grantcharov TP (2001) ³⁶	MIS.	MIST-VR	GRS	14	PG	ST, SPc			M			12	N						
Haluck RS (2001) ³⁷	MIS.	Virtual Laparoscopic Interface		.	MS, PG, MD	R, ST, SPc			T			11	N						
Lentz GM (2001) ³⁸	MIS., Open surg	GRS	Time	36	PG	K, ST, SPc		IS	T		C, R	11	Y	L	U	H	L		
McNatt SS (2001) ³⁹	MIS.	MIST-VR, modified platform		8	PG, MD	ST, SPc			T			11.5	N						
Morgan PJ (2001) ⁴⁰	Anesth	Checklist	GRS	145	MS	SPc		IS	M		R	11.5	Y	L	L	H	L	H	L
Morgan PJ (2001) ⁴¹	Anesth	Checklist		145	MS	K, SPc, BP	C	IS	M		IC, R	14.5	Y	L	L	H	L	U	H
Ost D (2001) ⁴²	Endosc	AccuTouch Bronchoscopy		28	PG, MD, RN, O	ST, SPc, BT, BP			T			13.5	N						
Paisley AM (2001) ⁴³	MIS., Open surg	Other:knot strength (tensiometer)	MIST-VR, Checklist, Time, Counts	89	MS, PG, MD	ST, SPc, SPd, BP			M,T			13.5	Y	H	U	L	L	H	L
Perkins GD (2001) ⁴⁴	Resusc	Single item		.	O	SPc		IS			R, TR	12.5	Y	L	L	U	L		
Pugh CM (2001) ⁴⁵	Exam	e-Pelvis	Other	73	MS, MD	ST, SPc, SPd			T			12	N						
Rogers PL (2001) ⁴⁶	Resusc, Intern. med.	Checklist		24	MS	K, SPc			T			13	N						
Rosen J (2001) ⁴⁷	MIS.	Computer	Time, Other	8	PG, MD	ST, SPc		IS	T			10.5	Y	U	L	U	L		
Sherman KP (2001) ⁴⁸	MIS.	Virtual Environment Knee Arthroscopy Training Syst		43	PG	R, ST, SPc			T			11.5	N						
Smith CD (2001) ⁴⁹	MIS.	Skills Assessment Device		10	A	ST, SPc						8	N						
Tytherleigh MG (2001) ⁵⁰	Open surg	GRS		4	PG	SPc		IS			R	12	N						
Ahlberg G (2002) ⁵¹	MIS.	GRS	MIST-VR	29	MS	SPc			M,T			15.5	Y	H	L	U	L	L	L
Cotin S (2002) ⁵²	MIS.	Virtual Laparoscopic Interface	Other	20	PG, MD	ST, SPc	C		T			9.5	Y	H	U	L	L		
Datta V (2002) ⁵³	Endosc	PreOp flexible sigmoidoscopy		45	PG, MD	ST, SPc			T			10.5	N						
Ferlitsch A (2002) ⁵⁴	Endosc	GI Mentor		24	PG, MD	ST, SPc			T			12.5	N						
Forrest FC (2002) ⁵⁵	Anesth	Checklist		13	PG, MD	SPc	C	IS	T		R	15	Y	H	L	U	L		
Francis NK (2002) ⁵⁶	Endosc	Advanced Dundee Endoscopic Psychomotor Tester		40	PG, MD	ST, SPc, SPd			T			11.5	N						
Gallagher AG (2002) ⁵⁷	MIS.	MIST-VR		36	A	ST, SPc		IS	T		C, TR	14	Y	H	U	L	L		
Haluck RS (2002) ⁵⁸	MIS.	EndoTower		25	A	R, ST, SPc			M,T			12	Y	H	L	L	H	U	H
Jones T (2002) ⁵⁹	Airway, Venous, Nursing	Checklist		149	RN	K, SPc, BP		IS	M		R	12.5	Y	U	U	U	U	U	U
Murray D (2002) ⁶⁰	Resusc	Checklist	GRS	64	MS, PG	SPc	C	IS	M,T		R	13.5	Y	H	L	U	L	U	L
Neumann M (2002) ⁶¹	Endosc	GRS	Time	15	PG, MD, A	ST, SPc	C	IS	T		R	12.5	Y	H	U	U	L		
Pugh CM (2002) ⁶²	Exam	e-Pelvis	Other	87	MS	K, ST, SPc	C	IS	M		C	13.5	Y	L	L	L	L	U	L
Reznek MA (2002) ⁶³	Venous	CathSim		41	MS, PG, MD	R, ST, SPc, SPd			T			10.5	N						
Schijven M (2002) ⁶⁴	MIS.	Xitact LS500		120	PG, MD	R						8.5	N						
Schijven MP (2002) ⁶⁵	MIS.	Advanced Dundee Endoscopic Psychomotor Tester	Other	45	PG, MD	R, ST, SPc, SPd			M,T			10.5	Y	H	U	L	L	H	H

Author, year	Topic	Coded instrument	Other instrument	N	Trainee class	Outcomes	Validity Evidence					QUADAS-2 (N=217)							
							Content	Resp Proc	Internal structure	Relations	other var.	Conseq.	Reliability	MERSQI	Full	Selection	Flow	Index Rob	Index Appl
Schwid HA (2002) ⁶⁶	Anesth	Checklist		99	PG	R, K, ST, SPc, BP	C	IS	M,T		IC, R	15.5	Y	H	L	U	H	H	L
Shah J (2002) ⁶⁷	Endosc	UroMentor		17	MS, PG, MD	ST, SPc			T			12	N						
Smith SG (2002) ⁶⁸	MIS.	ICSAD		15	PG, MD	ST, SPc			T			12	N						
Adrales GL (2003) ⁶⁹	MIS.	GRS	Single item	23	MS, PG, MD	SPc		IS			R	12.5	N						
Adrales GL (2003) ⁷⁰	MIS.	GRS	Single item, Checklist, Time	27	MS, PG, MD	R, ST, SPc			T			12.5	N						
Bann S (2003) ⁷¹	Open surg	Other:identify technical errors in fixed models (O)		89	PG	K			T			11.5	N						
Bann S (2003) ⁷²	MIS., Open surg	GRS	MIST-VR, ICSAD, Single item, Time, Other	70	PG	K, ST, SPc, SPd	C	IS	T		C	14.5	Y	H	L	L	L	L	L
Bann SD (2003) ⁷³	Open surg	ICSAD		35	PG, A	ST, SPc			M,T			12	Y	H	U	L	L	L	L
Bloom MB (2003) ⁷⁴	Endosc	Upper GI Endoscopy Simulator		35	PG	R, ST, SPc			T			10.5	N						
Boulet JR (2003) ⁷⁵	Resusc	Checklist		37	MS, PG	SPc	C	IS	T		R	13.5	Y	H	L	L	L		
Fraser SA (2003) ⁷⁶	MIS.	MISTELS		165	MS, PG, MD	SPc			T	Cq		13	Y	H	U	U	L		
Gallagher AG (2003) ⁷⁷	MIS.	MIST-VR	Counts	210	MD	ST, SPc, SPd		IS	T		IC	14	Y	H	L	L	L		
Gordon JA (2003) ⁷⁸	Resusc	GRS		23	MS, PG	SPc	C	IS	M,T		R	14	Y	H	L	H	L	H	L
Grancharov TP (2003) ⁷⁹	MIS.	MIST-VR		41	A	ST, SPc			T			12.5	N						
Gray SA (2003) ⁸⁰	Dentist	Computer		29	D	K, SPc			M			12	N						
Imber S (2003) ⁸¹	Dentist	DentSim	Other	26	D	SPd			M			12	N						
Khan MS (2003) ⁸²	Open surg	OSATS	ICSAD	93	MS, PG, MD	ST, SPc		IS	M,T		R	11.5	Y	H	U	H	L	H	L
MacDonald J (2003) ⁸³	Endosc	PreOp flexible sigmoidoscopy		24	PG, MD	ST, SPc, SPd			T			10.5	N						
Mahmood T (2003) ⁸⁴	Endosc	HT Immersion Colonoscopy Simulator		25	PG, MD	ST, SPc			T			11.5	N						
Moorthy K (2003) ⁸⁵	Endosc	HT Bronchoscopy simulator		18	MD, A	R, ST, SPc			T			11	N						
Murphy AA (2003) ⁸⁶	Ob	Other:no details		20	MS, PG	R, K, SPc			T			9.5	N						
Neumann M (2003) ⁸⁷	Endosc	GRS	Time	56	PG	ST, SPc	C					15	N						
Neumann M (2003) ⁸⁸	Endosc	GRS		25	MS, PG, MD	SPc	C		T			13	Y	H	L	U	L		
Nielsen PE (2003) ⁸⁹	Ob	OSATS		18	PG	SPc	C	IS	M,T		IC	13.5	Y	L	L	H	L	H	L
Ritter EM (2003) ⁹⁰	Endosc	GI Mentor II		11	A	ST, SPc		IS	T		TR	13	Y	H	U	L	L		
Schijven M (2003) ⁹¹	MIS.	Xitact LS500		74	PG, MD	R, ST, SPc		IS	T		IC	15	Y	H	L	L	L		
Sedlack RE (2003) ⁹²	Endosc	AccuTouch Colonoscopy		22	PG, MD	R, ST, SPc			T			11.5	N						
Sung WH (2003) ⁹³	MIS.	Virtual Laparoscopic Interface		10	A	ST, SPc		IS			TR	12	N						
Terkamp C (2003) ⁹⁴	Radiology	Other:detect abnormalities	Time	11	PG	ST, SPc, BP			M			12.5	N						
Tsai T-C (2003) ⁹⁵	Resusc, Nontech	Checklist	Counts	22	PG, MD	R, SPc	C	IS	T		IC, R	14	Y	H	L	U	L		
Weller JM (2003) ⁹⁶	Anesth, Nontech	GRS	O	.	O	SPc	C	IS	M		R	13.5	Y	H	L	H	L	U	L
Datta V (2004) ⁹⁷	Open surg	OSATS		56	PG, MD	SPc, BP		IS	M,T		R	13.5	Y	H	U	U	L	L	L
Feldman LS (2004) ⁹⁸	MIS.	MISTELS		50	PG	SPc, BP			M			14.5	N						

Author, year	Topic	Coded instrument	Other instrument	N	Trainee class	Outcomes	Validity Evidence					QUADAS-2 (N=217)									
							Content	Resp Proc	Internal structure	Relations	other var.	Conseq.	Reliability	MERSQI	Full	Selection	Flow	Index Rob	Index Appl	Ref Rob	Ref Appl
Fried GM (2004) ⁹⁹	MIS.	MISTELS		215	PG, MD	ST, SPc, BP		RP		M,T			15.5	Y	H	U	H	L	U	L	
Gallagher AG (2004) ¹⁰⁰	MIS.	MIST-VR		100	MS	ST, SPc				T			13.5	N							
Gisondi MA (2004) ¹⁰¹	Resusc, Nontech	Checklist		27	PG	SPc	C			T			12.5	Y	L	L	H	L			
Hsu JH (2004) ¹⁰²	Endovasc	VIST		41	MS, PG, MD, O, A	ST				T			13	N							
Johnson DB (2004) ¹⁰³	Endosc	Basic Performance Resource	GRS	32	MS	ST, SPc			IS	M	Cq		12	Y	U	U	L	L	U	L	
Kropmans TJB (2004) ¹⁰⁴	Dentist	Other: probing depth		15	D	SPc			IS	T		IC, C, R, TR	13	Y	U	L	L	L	L	L	
Moorthy K (2004) ¹⁰⁵	MIS.	Checklist	ICSAD	26	A	ST, SPc	C		IS	M,T		R	13.5	Y	H	L	U	L	L	L	
Moorthy K (2004) ¹⁰⁶	Endosc	GRS	GI Mentor	32	A	R, ST, SPc, SPd			IS	M,T		R	12	Y	H	U	U	L	L	L	
Moorthy K (2004) ¹⁰⁷	Endosc	GRS	Accutouch Endoscopy	20	A	ST, SPc			IS	M,T		IC, R	11.5	Y	H	U	U	L	L	L	
Morgan PJ (2004) ¹⁰⁸	Anesth	Checklist		135	MS	K, SPc, BP	C		IS	M		IC, R	14.5	Y	L	L	U	L	U	H	
Murray DJ (2004) ¹⁰⁹	Anesth	Single item	Checklist, Time	28	PG	ST, SPc	C		IS	M,T		C, R	13.5	Y	L	L	H	L	L	L	
Rosenstock C (2004) ¹¹⁰	Anesth, Nontech	Checklist		36	PG	K, SPc	C	RP	IS	M		R	13.5	Y	U	L	U	L	U	U	
Rossi JV (2004) ¹¹¹	Microsurg	EyeSi		22	MS, PG, MD	ST, SPc				T			12	N							
Schijven MP (2004) ¹¹²	MIS.	Xitact LS500		33	PG	R, SPc				T			11.5	N							
Sokollik C (2004) ¹¹³	MIS.	Computer		56	A	ST, SPc	C			T			12	Y	H	U	L	L			
Srivastava S (2004) ¹¹⁴	MIS.	Procedicus Virtual Arthroscopy		35	MS, PG, MD, A	R, ST, SPc			IS	T		IC	13.5	Y	H	L	L	H			
Stylopoulos N (2004) ¹¹⁵	MIS.	Computer-Enhanced Laparoscopic Training System		8	A	ST, SPc	C			T			10	Y	H	L	L	L			
Sweet R (2004) ¹¹⁶	Endosc	University of Washington TURP Simulator		91	MD, A	R, ST, SPc, SPd	C			T			11.5	Y	H	H	L	L			
Weller J (2004) ¹¹⁷	Resusc, Nontech	GRS	Checklist	71	MS	R, SPc				T			12	N							
Adamsen S (2005) ¹¹⁸	MIS., Endosc	GI Mentor II		24	A	ST, SPc	C			M,T			14	Y	H	L	U	L	L	L	
Arora H (2005) ¹¹⁹	Endosc	Endoscopic Sinus Surgery Simulator		38	MS, PG	R, SPc				M			13	N							
Avgerinos DV (2005) ¹²⁰	MIS.	MISTELS	MIST-VR	32	MS, PG	ST, SPc				T			12.5	N							
Bann S (2005) ¹²¹	MIS., Open surg	OSATS	MIST-VR, ICSAD, Other	11	PG	K, ST, SPc, SPd			IS	T		C, R, TR	14	Y	H	L	L	L			
Beard JD (2005) ¹²²	Open surg	Checklist		33	PG	SPc, BP			IS	M		C	13.5	Y	U	L	U	L	U	H	
Beard JD (2005) ¹²³	Open surg	Checklist		83	MD	SPc				T			11.5	N							
Berkenstadt H (2005) ¹²⁴	Anesth	GRS		31	PG	R, SPc	C		IS			IC, R	12.5	Y	U	L	U	L			
Blum RH (2005) ¹²⁵	Anesth, Resusc	Counts	Other	40	PG, MD	SPc	C			M,T			10	Y	H	L	H	L	H	L	
Crofts JF (2005) ¹²⁶	Ob	GRS		38	PG, MD, O	SPc	C						11.5	N							
Curran VR (2005) ¹²⁷	Resusc	GRS		30	MS	R, SPc	C		IS			R	11.5	Y	U	L	U	H			
Dauster B (2005) ¹²⁸	MIS.	MISTELS		17	PG, MD	SPc				T			12.5	N							
Dubrowski A (2005) ¹²⁹	Open surg	Computer	Time	13	PG, MD	ST, SPc				T			11	N							

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							Content	Resp Proc	Internal structure	Relations	other var.	Conseq.	Reliability	MERSQI	Full	Selection	Flow	Index Rob	Index Appl	Ref Rob
Duffy AJ (2005) ¹³⁰	MIS.	LapSim		54	PG, MD	ST, SPc			T				11	N						
Eriksen JR (2005) ¹³¹	MIS.	LapSim		24	A	ST, SPc			T				11	N						
Felsher JJ (2005) ¹³²	Endosc	GI Mentor		75	PG, MD	ST, SPc, SPd			T				12	N						
Fichera A (2005) ¹³³	MIS.	MISTELS		40	PG, MD	SPc			T				12	N						
Grantcharov TP (2005) ¹³⁴	Endosc	GI Mentor II		28	MS, PG, MD	ST, SPc, SPd			T				10.5	N						
Hance J (2005) ¹³⁵	Open surg	OSATS		40	PG, MD	SPc	C	IS	T		C, R	13.5	Y	H	L	U	L			
Hesselfeldt R (2005) ¹³⁶	Airway	Counts	Time	60	PG, MD, RN	R, ST, SPd			T	Cq			10.5	Y	H	L	U	L		
Kallstrom R (2005) ¹³⁷	Endosc			7	MS	ST, SPc	C		T				12.5	Y	H	L	L			
Katz R (2005) ¹³⁸	MIS.	Time		44	PG, MD	ST			T				10.5	N						
Korndorffer JR, Jr. (2005) ¹³⁹	MIS.	Time		142	MS, PG, MD	ST			T				12	N						
Lebuffe G (2005) ¹⁴⁰	Anesth	Checklist	Time	48	PG	R, ST, SPc			T				11.5	N						
Madan AK (2005) ¹⁴¹	MIS.	MIST-VR	GRS, Time	32	MS	ST, SPc			M				12	N						
Madan AK (2005) ¹⁴²	MIS.	Counts	Time	36	MS	ST, SPc			M				11	N						
Moorthy K (2005) ¹⁴³	Open surg, Nontech	GRS	OSATS, ICEPS, Checklist, Counts	27	PG	SPc	C	IS	M,T		R	13.5	Y	H	L	U	L	L	H	
Murray DJ (2005) ¹⁴⁴	Anesth	Checklist	Single item	43	PG, RN	SPc	C	IS	T	C, R	14.5	Y	H	L	H	L				
Neumann M (2005) ¹⁴⁵	Endosc	Single item		58	MS, PG	R, SPc			M				15	N						
Ro CY (2005) ¹⁴⁶	MIS.	LapSim		29	PG, MD	SPc			T				11.5	N						
Sereno-Trabaldo S (2005) ¹⁴⁷	MIS.	Counts	Time	15	PG, MD	ST, SPc			T				12	N						
Sherman V (2005) ¹⁴⁸	MIS.	LapSim		24	MS, PG, MD	ST, SPc			T				11	N						
Stefanidis D (2005) ¹⁴⁹	MIS.	Time	MIST-VR	14	PG	ST, SPc			T				13	N						
Stitik TP (2005) ¹⁵⁰	Bedside	GRS		30	PG	K, SPc, BP			M				13	N						
Uchali M (2005) ¹⁵¹	MIS.	Counts	MIST-VR, Time, Other	23	PG, MD	R, ST, SPc, SPd		IS	M,T	R, TR	15.5	Y	H	L	L	L	L	L		
Van Sickles KR (2005) ¹⁵²	MIS.	ProMIS		10	MS, PG, MD	R, ST, SPc		IS	T	IC	12	Y	H	U	L	L				
Weller JM (2005) ¹⁵³	Anesth	GRS	Single item	21	PG	R, SPc	C	IS	M	C, R	13.5	Y	L	L	L	H	L			
Aggarwal R (2006) ¹⁵⁴	Endovasc	VIST		20	MD	ST, SPc			T				11	N						
Ayodeji ID (2006) ¹⁵⁵	MIS.	LapMentor		49	A	R							7	N						
Bergus G (2006) ¹⁵⁶	Nontech, Intern. med.	Checklist	Other	67	MS	R, SPc			Cq				11.5	N						
Berkenstadt H (2006) ¹⁵⁷	Anesth	Checklist	Single item, Counts	145	PG	R, SPc, SPd	C	IS	M	Cq	C, R	12.5	Y	U	U	H	L	U	L	
Berry M (2006) ¹⁵⁸	Endovasc	VIST		16	MS, MD	R, ST, SPc, SPd			T				10.5	N						
Black M (2006) ¹⁵⁹	MIS.	Time		19	PG	ST		IS	T				11.5	Y	H	L	U	L		
Broe D (2006) ¹⁶⁰	MIS.	OSATS	ProMIS	20	PG	ST, SPc	C	IS	T	R	13.5	Y	H	L	L	L				
Chen J-S (2006) ¹⁶¹	Endosc	Computer-Based Bronchoscopy Simulator		30	MD, A	R, ST, SPc			T				13.5	N						

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							Content	Resp Proc	Internal structure	Relations	other var.	Conseq.	Reliability	MERSQI	Full	Selection	Flow	Index Rob	Index Appl	Ref Rob
Datta V (2006) ¹⁶²	Open surg	Other:Surgical Efficiency Score	OSATS, ICSAD, Single item	30	PG, MD	ST, SPc, SPd		IS	M		R	13.5	Y	U	U	U	L	U	L	
Dupuis O (2006) ¹⁶³	Ob	Computer		8	PG, MD	SPc			T			10	N							
Enochsson L (2006) ¹⁶⁴	Endosc	GI Mentor II		29	PG, MD	ST, SPc			T			10.5	N							
Gould DA (2006) ¹⁶⁵	Endovasc	GRS	Time	55	A	R, ST, SPc	C	IS	T		R	11.5	Y	H	L	U	L			
Hislop SJ (2006) ¹⁶⁶	Endovasc	OSATS	VIST, GRS, Time	64	MS, PG, MD, O, A	ST, SPc, SPd	C	IS	M,T	Cq	R	13.5	Y	H	L	U	L	U	L	
Kim J (2006) ¹⁶⁷	Resusc, Nontech	GRS		60	PG	SPc	C	RP	IS	T	C, R	13.5	Y	H	L	L	L			
Knudsen BE (2006) ¹⁶⁸	Oth. surg	PERC Mentor	GRS	63	MS, PG	ST, SPc, SPd	C			M,T			14	Y	U	U	L	L	H	L
Larsen CR (2006) ¹⁶⁹	MIS.	LapSim		32	PG, MD	ST, SPc	C			T			13	Y	H	L	L	L		
Lockyer J (2006) ¹⁷⁰	Resusc	GRS		448	RN, O, A	K, SPc	C	IS	M		IC	14.5	Y	U	L	U	L	U	H	
Maithel S (2006) ¹⁷¹	MIS.	Computer-Enhanced Laparoscopic Training System		91	PG, MD	R, ST, SPc				T			13	N						
Matsumoto ED (2006) ¹⁷²	Endosc	OSATS	UroMentor, Other	16	PG	R, ST, SPc	C			M,T			13	Y	H	L	U	L	L	L
McCarthy AD (2006) ¹⁷³	MIS.	Sheffield Knee Arthroscopy Training System		25	PG, MD	R, ST, SPc	C			T			12.5	Y	H	L	L	L		
McDougall EM (2006) ¹⁷⁴	MIS.	LapMentor		103	MS, PG, MD	R, SPc				T			10.5	N						
McKenzie FD (2006) ¹⁷⁵	Exam	Counts		105	MS	SPd				M			10	N						
Moorthy K (2006) ¹⁷⁶	Open surg, Nontech	NOTECHS	OSATS, Counts, Other	20	PG	R, ST, SPc, SPd	C	IS	T		IC, R	12.5	Y	H	U	L	L			
Morris D (2006) ¹⁷⁷	Open surg	Single item		15	PG, MD, A	SPc				T			10.5	N						
Nicholson WJ (2006) ¹⁷⁸	Endovasc	VIST		100	MD	R							6	N						
Pandey VA (2006) ¹⁷⁹	Open surg	Other:total operative score	OSATS, ICEPS, Single item, Computer	30	PG, MD	SPc, SPd	C	IS	M,T		C, R	11.5	Y	H	U	U	L	U	H	
Patel AD (2006) ¹⁸⁰	Endovasc	VIST		20	MD	ST, SPc		IS			TR	12	N							
Rosenthal R (2006) ¹⁸¹	MIS.	Xitact LS500		20	MS	R, ST, SPc			T			11	N							
Savoldelli GL (2006) ¹⁸²	Anesth, Resusc	GRS	Single item	21	PG	R, K, SPc	C	IS	M		IC, R	13.5	Y	L	L	U	L	H	H	
Scavone BM (2006) ¹⁸³	Anesth, Airway	Checklist	Time	16	PG	ST, SPc	C	IS	T		R	13.5	Y	H	L	L	L			
Shah J (2006) ¹⁸⁴	Open surg	OSATS		40	PG	SPc		IS	T		R	12.5	Y	H	U	U	L			
Swanstrom LL (2006) ¹⁸⁵	MIS.	MISTELS		70	PG, MD	K, SPc	RP	IS	M,T		C	14.5	Y	H	L	U	L			
Vassiliou MC (2006) ¹⁸⁶	MIS.	MISTELS		12	MS, PG, MD	ST, SPc		IS			IC, R, TR	12	Y	U	L	L	L			
Verdaasdonk EGG (2006) ¹⁸⁷	Endosc	SimEndo		49	MS, A	R, ST, SPc				T			14.5	N						
Woodrum DT (2006) ¹⁸⁸	MIS.	LapSim		34	MS, PG, MD	ST, SPc				T			12	N						
van der Heide PA (2006) ¹⁸⁹	Resusc	Checklist		14	PG	SPc	C	RP	IS	T	R, TR	13.5	Y	H	H	U	L			
Adler MD (2007) ¹⁹⁰	Resusc	Checklist		78	PG	SPc	C	IS	T		R	13.5	Y	L	L	H	L			

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Ahlberg G (2007) ¹⁹¹	MIS.	LapSim		18	PG, A	ST, SPc, BT, BP, P			T	Cq			17	Y	H	L	L	L		
Ayodeji ID (2007) ¹⁹²	MIS.	LapMentor		49	PG, MD, A	R							7.5	N						
Black SA (2007) ¹⁹³	Open surg	GRS	OSATS, ICSAD, ICEPS, Single item	41	PG, MD	R, ST, SPc, SPd			IS	T		R	12.5	Y	H	L	L	L		
Botden SMBI (2007) ¹⁹⁴	MIS.	ProMIS		90	PG, MD	R, ST, SPc			T				12	N						
Butler NN (2007) ¹⁹⁵	Open surg	Checklist		12	PG	SPd			IS	T	R, TR	11.5	Y	U	L	L	L			
Curtis DA (2007) ¹⁹⁶	Dentist	GRS		80	D	K, SPd, P			IS	M	R	14.5	Y	L	L	U	L	U	L	
Duncan JR (2007) ¹⁹⁷	Endovasc	AngioMentor		5	PG, MD	ST, SPc	C	IS	T		R, TR	12	Y	H	L	U	L			
Fialkow M (2007) ¹⁹⁸	Endosc, Open surg	OSATS	Time	55	PG	R, ST, SPc		IS	T		IC, R	14	Y	H	U	U	L			
Fried MP (2007) ¹⁹⁹	Endosc	Endoscopic Sinus Surgery Simulator		34	MS, PG, MD	ST, SPc		IS	T	Cq	IC	14	Y	H	L	L	L			
Girzadas DV, Jr (2007) ²⁰⁰	Airway, Resusc	Time	Checklist	44	PG	ST, SPc	C		T			12.5	Y	H	L	H	L			
Goff BA (2007) ²⁰¹	Endosc	OSATS	Accutouch Hysteroscopy, Time	13	PG, MD	R, ST, SPc		IS	M,T		IC, R	13	Y	L	L	U	L	L	L	
Gomoll AH (2007) ²⁰²	MIS.	Procedicus Virtual Arthroscopy		43	MS, PG, MD	ST, SPc			T			11	N							
Heinrichs WL (2007) ²⁰³	MIS.	LapSim		17	MD	R, SPc		IS	T	Cq	TR	14.5	Y	H	H	L	L			
Hemman EA (2007) ²⁰⁴	Resusc	Checklist		53	EMT	K, SPc	C	IS	M	Cq	R, TR	14	Y	L	L	U	L	U	H	
Hogle NJ (2007) ²⁰⁵	MIS.	LapSim		29	MS	ST, SPc		IS			TR	12	N							
Khan MS (2007) ²⁰⁶	Open surg	OSATS	ICSAD	65	PG, MD	ST, SPc		IS	M,T		R	13.5	Y	H	L	U	L	U	L	
Leung JW (2007) ²⁰⁷	Endosc, Radiology	Time		23	PG, MD	R, ST			T			11.5	N							
Mackel TR (2007) ²⁰⁸	Exam	e-Pelvis		112	MS, A	SPc	C	IS	T	Cq		13.5	Y	H	L	L	L			
Malec JF (2007) ²⁰⁹	Anesth, Resusc, Nontech	GRS		107	PG, RN	SPc	C	IS	T			11.5	Y	U	L	H	L			
Mathis KL (2007) ²¹⁰	MIS.	SurgicalSim Laparoscopic trainer		25	MS, MD	ST, SPc			T			12.5	N							
McCluney AL (2007) ²¹¹	MIS.	MISTELS		40	PG, MD	ST, SPc, BP			M,T	Cq		13.5	Y	U	L	U	L	L	L	
Moreau R (2007) ²¹²	Ob	Computer		3	PG	SPc			T			9.5	N							
Morgan PJ (2007) ²¹³	Anesth	Checklist		3	A	SPc	C	RP	IS		R	13	Y	H	L	U	L			
Morgan PJ (2007) ²¹⁴	Nontech, Ob	Single item	GRS	34	PG, MD, RN	SPc	C	IS	M,T		R	12.5	Y	L	L	H	L	H	L	
Murray DJ (2007) ²¹⁵	Anesth	Checklist		99	PG, MD	SPc	C	IS	T		C, R	14.5	Y	H	L	L	L			
Newmark J (2007) ²¹⁶	MIS.	Counts	LapSim, Time	47	MS	ST, SPc			M			12	N							
Nistor V (2007) ²¹⁷	MIS.	UCLA Laparoscopic Training System		5	A	ST, SPc	C		T			9.5	Y	H	U	L	L			
Ottestad E (2007) ²¹⁸	Anesth, Resusc, Nontech	Checklist	GRS	23	PG, MD, O	SPc	C	IS	M		R	12.5	Y	U	U	H	L	H	L	
Park J (2007) ²¹⁹	Endosc	AccuTouch Colonoscopy	GRS, Time	28	PG	ST, SPc, BP, P			M			16	N							
Rashid HH (2007) ²²⁰	Endosc	TURP simulator (proprietary)		136	PG, MD, A	SPc			T			10.5	N							
Ringsted C (2007) ²²¹	Resusc	Checklist	Single item	33	MS, PG	K, SPc	RP	IS	T	Cq	C, R	14.5	Y	H	L	U	L			

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							Content	Resp Proc	Internal structure	Relations	other var.	Conseq.	Reliability	MERSQI	Full	Selection	Flow	Index RoB	Index Appl	Ref RoB
Ritter EM (2007) ²²²	MIS.	ProMIS	MISTELS	60	MS, PG, MD	ST, SPc		IS	M,T			R	13	Y	H	H	L	L	U	L
Rosenthal R (2007) ²²³	MIS., Open surg	Xitact LS500	Single item	307	PG	ST, SPc			M,T				12	Y	H	L	L	H	L	
Sedlack RE (2007) ²²⁴	Endosc	GI Mentor II (EGD)		21	PG, MD, RN	R, ST, SPc, BP			T				15	N						
Sedlack RE (2007) ²²⁵	Endosc	Counts	Time	39	PG, MD, O	R, ST, SPc, BT	C	IS	M,T			R	14	Y	H	L	U	L	L	
Sewell C (2007) ²²⁶	Open surg	Single item	Mastoidectomy simulator, GRS	15	PG, A	SPc		IS	M,T			R	12.5	Y	H	L	U	L	L	
Sharaf AA (2007) ²²⁷	Dentist	Single item		30	D	SPd		IS				R, TR	11	Y	U	U	U	L		
Siddighi S (2007) ²²⁸	Open surg, Ob	OSATS		26	PG	SPc	C	IS	M,T			IC, R, TR	14.5	Y	H	L	H	L	U	
Stefanidis D (2007) ²²⁹	MIS.	Time	EndoTower with Virtual Laparoscopic Interface, GRS	90	PG, MD, A	R, ST, SPc			T				13.5	N						
Stefanidis D (2007) ²³⁰	MIS.	Other:suturing score [time, process, product]	Single item, Time	29	PG, MD, A	ST, SPc, SPd	C		T				12	Y	H	L	L	L		
Sudhir G (2007) ²³¹	Airway	Single item		36	MS, PG, MD	R, SPd			T				11.5	N						
Sugiono M (2007) ²³²	MIS.	Time		11	PG, MD	ST, BT, P			M				13.5	N						
Torgerson CS (2007) ²³³	Open surg	GRS	Other	44	MS, PG, MD	SPc, SPd			T				11.5	N						
Van Herzele I (2007) ²³⁴	Endovasc	VIST		45	MD	R, ST, SPc			T				12	N						
Van Sickel KR (2007) ²³⁵	MIS.	MIST-VR		57	MD	ST, SPc			T	Cq			12.5	Y	H	H	L	L		
Verdaasdonk EGG (2007) ²³⁶	Endosc	SimEndo		61	A	ST, SPc			T				12	N						
Vick LR (2007) ²³⁷	Open surg	Other:bursting pressure	Time	21	PG, MD	R, ST, SPd			T				10.5	N						
Wierinck ER (2007) ²³⁸	Dentist	DentSim		18	D	ST, SPd			T				12	N						
Wilarsrusmee C (2007) ²³⁹	Open surg	Counts	Time	29	PG	ST, SPd, BT, BP, P			M				14.5	N						
Woodrow SI (2007) ²⁴⁰	Open surg	Other:human rater (breaches)	Computer, Time	19	PG, MD	ST, SPc, SPd			T				12	N						
Yamaguchi S (2007) ²⁴¹	MIS.	LapMentor		31	A	ST, SPc			T				10.5	N						
Yi SY (2007) ²⁴²	Endosc	KAIST-ehwa colonoscopy		5	PG, A	R, ST, SPc							9	N						
Zirkle M (2007) ²⁴³	Open surg	Single item	Computer, Time	19	PG	ST, SPc		IS	T			R	14	Y	H	U	L	L		
Zirkle M (2007) ²⁴⁴	Open surg	Checklist	Single item, GRS, Other	19	PG	SPc, SPd	C	IS	M,T			R	13.5	Y	H	L	H	L	H	
van Dongen KW (2007) ²⁴⁵	MIS.	LapSim		48	MS, PG, MD	ST, SPc			T				12.5	N						
Andreatta PB (2008) ²⁴⁶	MIS.	LapMentor		30	MS, PG, MD, A	ST, SPc		IS	T			C	14	Y	H	L	L	L		
Arden D (2008) ²⁴⁷	MIS.	Time		29	MS, PG	ST			T				12.5	N						
Berry M (2008) ²⁴⁸	Endovasc	VIST		32	MS, MD	R, ST, SPc, SPd			T				13.5	N						

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Boon JR (2008) ²⁴⁹	MIS.	Counts	Time	12	MS, PG	ST, SPd			T				10.5	N						
Botden SMBI (2008) ²⁵⁰	MIS.	ProMIS		50	PG, MD	R							6.5	N						
Botden SMBI (2008) ²⁵¹	MIS.	ProMIS		55	PG, MD	R							8.5	N						
Boulet JR (2008) ²⁵²	Anesth	Checklist	Single item	.	O	R, SPc		IS	M	Cq			12	Y	H	H	L	L	L	L
Brett-Fleegler MB (2008) ²⁵³	Resusc	Checklist		25	PG	R, SPc	C	IS	T		R	14	Y	H	L	H	L			
Brewster LP (2008) ²⁵⁴	Open surg, Nontech	GRS		7	PG	SPc	C	IS	M		IC, R	12.5	Y	H	U	H	L	U	L	
Cesanek P (2008) ²⁵⁵	MIS.	Other:tissue damage	ProMIS, Single item, Time	20	PG	ST, SPc, SPd		IS	M		R	12.5	Y	H	L	U	L	L	L	
Cone SW (2008) ²⁵⁶	Airway	Single item	Computer, Time	12	MS, A	ST, SPc, SPd						7.5	N							
Crabtree NA (2008) ²⁵⁷	Endosc, Airway	Time		30	O	ST, BT, BP			M			14	N							
Davoudi M (2008) ²⁵⁸	Endosc	Checklist	GRS	22	MS, PG, MD	SPc		IS	T		R, TR	13	Y	H	L	U	L			
Dayan AB (2008) ²⁵⁹	MIS.	Checklist	Time	32	PG, MD	R, ST, SPc		IS	T		R	13.5	Y	H	L	U	L			
Egi H (2008) ²⁶⁰	MIS.	Hiroshima University Endoscopic Surgical Assessment Device		37	MS, MD	ST, SPc		IS	T			12	Y	H	L	L	L			
Feifer A (2008) ²⁶¹	MIS.	ProMIS		15	PG	ST, SPc			T			13	N							
Gettman MT (2008) ²⁶²	Endosc	UroMentor		57	PG, MD, RN, A	R, ST			T			11	N							
Glaiberman CB (2008) ²⁶³	Endovasc	VIST		11	PG, MD	ST, SPc		IS	T			11	Y	H	U	L	L			
Gomoll AH (2008) ²⁶⁴	MIS.	Procedicus Virtual Arthroscopy		10	PG	ST, SPc			T			12	N							
Goova MT (2008) ²⁶⁵	Open surg	Other:time-error composite	Time, Counts	41	PG, MD	ST, SPc	C		T			13	Y	H	L	U	L			
Guise J-M (2008) ²⁶⁶	Nontech, Ob	GRS		.	O	SPc	C	IS	T		R	13.5	Y	H	L	L	L			
Harders M (2008) ²⁶⁷	Endosc	Computer		.	PG, MD	C						4	N							
Hatala R (2008) ²⁶⁸	Exam	GRS		28	MD	SPc	C	IS	M	Cq	R	14	Y	H	H	U	L	U	L	
Howells NR (2008) ²⁶⁹	MIS.	Computer		35	A	ST, SPc			T			12.5	N							
Koch AD (2008) ²⁷⁰	Endosc	GI Mentor II		105	PG, A	R, ST, SPc			T			11.5	N							
Koch AD (2008) ²⁷¹	Endosc	Olympus Endo TS-1		49	PG, MD	R, ST, SPc			T			12.5	N							
Kolkman W (2008) ²⁷²	MIS.	MISTELS		23	MS, MD	ST, SPc			T			13.5	N							
Lee KHK (2008) ²⁷³	Resusc	Single item	Checklist	12	EMT	R, SPc		RP				10.5	N							
Lendvay TS (2008) ²⁷⁴	Rob. surg	dV Trainer		27	MD, A	R, ST, SPc			T			11	N							
Leong JJ (2008) ²⁷⁵	Open surg	OSATS	ICSAD, Time	21	PG, MD	R, ST, SPc, SPd	C	IS	M,T		R	14	Y	H	L	U	L	L	L	
Leung RM (2008) ²⁷⁶	Endosc	GRS	ICSAD, Checklist, Other	16	PG, MD	ST, SPc, SPd	C	IS	M,T		R	15.5	Y	H	L	U	H	U	L	
Mahr MA (2008) ²⁷⁷	Microsurg	EyeSi		15	PG, MD	ST, SPc			T			12	N							
Molinas CR (2008) ²⁷⁸	MIS.	Counts	Time	307	MS, PG, MD	ST, SPc			T			12	N							
Moore AK (2008) ²⁷⁹	MIS.	MIST-VR		26	MS, PG, MD	SPc						11.5	N							
Neary PC (2008) ²⁸⁰	MIS.	Counts	ProMIS	14	MD	ST, SPc, SPd		IS	T		R, TR	12.5	Y	H	L	U	L			
Noh Y (2008) ²⁸¹	Airway	Waseda-Kyotokagaku Airway 1R		12	MD, A	ST, SPc	C		T			12.5	Y	H	L	L	L			
Saleh GM (2008) ²⁸²	Microsurg	Computer	Time	30	A	ST, SPc	C		T			11.5	Y	H	U	L	L			

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							Content	Resp Proc	Internal structure	Relations	other var.	Conseq.	Reliability	MERSQI	Full	Selection	Flow	Index Rob	Index Appl	Ref Rob
Sevdalis N (2008) ²⁸³	Open surg, Nontech	NOTECHS		141	A	SPc	C	IS				IC	11.5	Y	U	U	U	L		
Sewell C (2008) ²⁸⁴	Open surg	Other:bone removed	Single item, Computer	15	PG, MD, A	SPc, SPd		IS	M,T				10.5	Y	H	U	L	L	L	L
Siddiqui NY (2008) ²⁸⁵	Open surg, Ob	OSATS	Time	40	PG	ST, SPc	C	IS	T			R, TR	14	Y	L	L	L	L		
Todd M (2008) ²⁸⁶	Nontech, Nursing	Checklist		72	RN	SPc	C	IS				R	9.5	Y	U	U	U	L		
Tzafestas CS (2008) ²⁸⁷	Venous	Computer	Time	20	MD, RN	ST, SPc	C		T				13.5	Y	H	U	L	L		
Van Herzele I (2008) ²⁸⁸	Endovasc	VIST		47	PG, MD	ST, SPc, SPd			T				11.5	N						
Van Sickle KR (2008) ²⁸⁹	MIS.	Time	Counts	32	MS, PG, MD	ST, SPc		IS	T			R	13.5	Y	H	U	U	L		
Zhang A (2008) ²⁹⁰	MIS.	LapMentor		27	MS, PG, A	ST, SPc			T				10	N						
Zheng B (2008) ²⁹¹	MIS., Nontech	Other:composite score	Time	44	MS, PG, MD, A	ST, SPc	C		M,T				12.5	Y	H	U	U	L	H	H
Adler MD (2009) ²⁹²	Resusc	Checklist		81	PG	SPc	C	IS	T			R	16	Y	L	L	L	L		
Arnold JJ (2009) ²⁹³	Resusc	GRS		41	RN	K, SPc	C	IS	M,T			R	12.5	Y	H	H	U	L	H	H
Balkissoon R (2009) ²⁹⁴	Exam	Other:accuracy	Computer, Time	54	MS, PG	ST, SPc, SPd			T				11.5	N						
Botden SMBI (2009) ²⁹⁵	MIS.	GRS	ProMIS, Other	24	A	R, ST, SPc		IS	M,T			R	12.5	Y	H	L	U	L	L	L
Brydges R (2009) ²⁹⁶	Open surg	Single item	ICSAD, Other	48	MS	SPc, SPd		IS	M,T			R, TR	13	Y	U	L	U	L	U	U
Buzink SN (2009) ²⁹⁷	MIS.	Xitact		66	A	R, ST, SPc		IS	M,T			IC	13	Y	H	L	L	L	L	L
Carroll SM (2009) ²⁹⁸	Open surg	Checklist		34	PG	SPc			M				11.5	N						
Chipman JG (2009) ²⁹⁹	Open surg	OSATS		63	PG	SPc		IS	T			IC	13	Y	H	L	H	L		
Contag SP (2009) ³⁰⁰	Microsurg	GRS	Time	26	MS, PG, MD	ST, SPc			T				12	N						
Dolmans VEMG (2009) ³⁰¹	Endosc	UroMentor		89	PG, MD	R							8	N						
Hatala R (2009) ³⁰²	Exam	Checklist	Single item, GRS, Other	251	PG	SPc	C	RP	IS	M		R	12.5	Y	U	U	H	L	U	L
Haycock AV (2009) ³⁰³	Endosc	Olympus colonoscopy		34	MS, PG, MD, RN	R, ST, SPc, SPd			T				12.5	N						
Henrichs BM (2009) ³⁰⁴	Anesth	Checklist		61	MD, RN	SPc	C	IS	T			C, R	14.5	Y	H	L	L	L		
Huang GC (2009) ³⁰⁵	Venous	Checklist	Single item	42	PG	SPc	C	RP		M	Cq		12.5	Y	L	L	H	L	H	L
Insel A (2009) ³⁰⁶	MIS.	GRS	Checklist	68	PG, MD	SPc	C		T				12.5	Y	H	L	H	L		
Kenney PA (2009) ³⁰⁷	Rob. surg	dV Trainer		26	MS, PG, MD	R, ST, SPc			T				11.5	N						
Kim J (2009) ³⁰⁸	Resusc, Nontech	GRS		60	PG	SPc	C	RP	IS	T		R	13.5	Y	H	L	L	L		
Kolesnikov M (2009) ³⁰⁹	Dentist	PerioSim		30	D, O	R							4	N						
Kundhal PS (2009) ³¹⁰	MIS.	LapSim		10	PG	ST, SPc, BT, BP			M				12	N						
Kössi J (2009) ³¹¹	MIS.	LapMentor		13	PG, MD	ST, SPc, BT			T				11.5	N						
Langley RGB (2009) ³¹²	Exam	Counts		95	PG, MD	R, SPd			T				11.5	N						
LeBlanc VR (2009) ³¹³	Open surg, Nontech	GRS	IPPI, Checklist	32	MS, PG	SPc		IS	M,T			IC, R	13.5	Y	H	L	H	L	H	L
Napier F (2009) ³¹⁴	Resusc	GRS	Single item	537	MS, PG, MD, RN, A	SPc	C	IS	M,T			IC	15	Y	L	L	H	L	H	L
Pellen M (2009) ³¹⁵	MIS.	OSATS	ProMIS, Counts	30	MS, PG, MD	ST, SPc	C	IS	M,T			R	13.5	Y	H	L	U	L	L	L

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Pellen MG (2009) ³¹⁶	MIS.	ProMIS	Counts	160	MS, PG, MD	ST, SPc			T				11.5	N					
Phitayakorn R (2009) ³¹⁷	Endosc	GI Mentor II		23	MD	ST, SPc	C						8.5	N					
Powers K (2009) ³¹⁸	MIS., Nontech	NOTECHS	GRS, Time, Counts	12	MD	R, ST, SPc			T				12.5	N					
Reiley CE (2009) ³¹⁹	Rob. surg	Computer		9	A	SPc			T				11.5	N					
Saleh GM (2009) ³²⁰	Microsurg	Computer		24	PG, MD	ST, SPc			T				11.5	N					
Salgado J (2009) ³²¹	MIS.	LapSim		8	PG	ST, SPc, BP			M				13.5	N					
Sankaranarayanan G (2009) ³²²	MIS.	Virtual Basic Laparoscopic Skill Trainer (VBLAST)	MISTELS	41	A	R							7.5	N					
Sansregret A (2009) ³²³	MIS.	LTS-2000	MISTELS	124	MS, PG, MD	R, ST, SPc, SPd		IS	M,T		C	14.5	Y	H	H	L	L	H	L
Schout BMA (2009) ³²⁴	Endosc	UroTrainer		104	PG, MD	R							8	N					
Schreuder HW (2009) ³²⁵	MIS.	LapSim		56	MS, PG, MD	R, ST, SPc			T				11.5	N					
Sethi AS (2009) ³²⁶	Rob. surg	dV Trainer		20	MS, PG, MD	R, ST	C		T				12.5	Y	H	L	L	L	
Sevdalis N (2009) ³²⁷	Nursing	GRS	Other	20	RN	SPc	C	IS	M		IC	13.5	Y	U	L	U	L	H	L
Shippey S (2009) ³²⁸	Open surg	GRS		3	MS, PG, MD	SPc	C	IS	T		IC	12.5	Y	H	L	L	L		
Solverson DJ (2009) ³²⁹	Microsurg	EyeSi		25	PG, MD	ST, SPc			T				12	N					
Stefanidis D (2009) ³³⁰	MIS.	ProMIS		11	MS, PG	ST, SPc			T	Cq			13	Y	U	L	L	H	L
Suebnukarn S (2009) ³³¹	Dentist	Computer	Time	20	D	ST, SPc, SPd			T				11.5	N					
Tashiro Y (2009) ³³²	MIS.	Computer		30	PG, MD	ST, SPc			T				11.5	N					
Van Herzele I (2009) ³³³	Endovasc	GRS	VIST, Counts	18	MD	ST, SPc	C	IS	M,T		R	14	Y	H	L	U	L	L	L
Volsky PG (2009) ³³⁴	Endosc	Counts	Time	18	PG, MD	R, ST, SPc			T				11	N					
Waldrop WB (2009) ³³⁵	Anesth	Checklist	Time	56	PG	ST, SPc	C	IS	M,T		C	13.5	Y	L	L	H	L	H	L
Weeks DL (2009) ³³⁶	Resusc	Checklist		27	O	R, SPc		IS			R	12	N						
Weidenbach M (2009) ³³⁷	Radiology	GRS		43	PG, MD, O	R, SPc	C		T				12.5	Y	H	U	U	H	
Willems MCM (2009) ³³⁸	Endovasc	GRS	OSATS, ICEPS, Time	18	PG, MD	ST, SPc	C	IS	T		R	13	Y	H	U	H	L		
Williams JB (2009) ³³⁹	Resusc, Nontech	GRS	Checklist	26	PG	SPc	C	IS	M		IC, R	13.5	Y	H	L	U	L	L	L
Willoteaux S (2009) ³⁴⁰	Endovasc	VIST		46	A	R, ST			T				11.5	N					
Wright MC (2009) ³⁴¹	Nontech, Intern. med.	GRS	Checklist	35	MS	SPc	C	IS	M		C, R	14	Y	U	U	U	L	U	L
Xeroulis G (2009) ³⁴²	MIS.	MISTELS	ICSAD	26	PG, MD	ST, SPc			M,T				12.5	Y	H	L	U	L	L
von Delius S (2009) ³⁴³	Endosc	GRS	Time	28	PG, MD	R, ST, SPc			T				11.5	N					
von Wyl T (2009) ³⁴⁴	Resusc, Nontech	GRS		30	EMT	SPc	C	IS	M		IC, R	12.5	Y	U	U	H	L	H	H
Allen B (2010) ³⁴⁵	MIS.	Computer		30	MS, PG, MD	ST, SPc	C		T				12.5	Y	H	L	L	L	
Bajka M (2010) ³⁴⁶	Endosc	HystSim		36	MS, MD	ST, SPc	C		T				12	Y	H	L	L	L	
Berger P (2010) ³⁴⁷	Endovasc	Other:total score	Checklist, GRS	43	PG, MD, O	SPc			T				13	N					

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							Content	Resp Proc	Internal structure	Relations	other var.	Conseq.	Reliability	MERSQI	Full	Selection	Flow	Index Rob	Index Appl
Bittner JG, IV (2010) ³⁴⁸	Endosc	GI Mentor II		12	PG, MD	R, ST, SPc			T				11.5	N					
Black SA (2010) ³⁴⁹	Open surg, Nontech	OSATS	ICEPS, NOTECHS	30	PG, MD	R, SPc			IS	M,T			R	13.5	Y	H	L	H	L
Brewin J (2010) ³⁵⁰	MIS.	MIST Nephrectomy		26	MS, PG, MD	R, ST, SPc			T				12	N					
Campo R (2010) ³⁵¹	MIS.	Time	Counts	199	PG, MD	R, ST, SPc			T				13.5	N					
Casabella Abril B (2010) ³⁵²	Resusc	GRS	Checklist	37	MS, PG, RN	SPc	C	RP	IS	T		R	14	Y	H	L	L	L	
Chandra V (2010) ³⁵³	MIS., Rob. surg	ProMIS	Single item	29	MS, PG, MD	R, ST, SPc, SPd	C		IS	T		IC	14	Y	H	L	L	L	
Coates PJB (2010) ³⁵⁴	Endovasc	VIST		22	PG, MD	ST, SPc			T				11	N					
Cooper S (2010) ³⁵⁵	Resusc, Nontech	GRS	Single item	15	MS, RN	R, SPc	C		IS	M		IC, R, TR	13.5	Y	U	L	H	L	H
Dong Y (2010) ³⁵⁶	Venous	Checklist	Time, Counts	105	PG, MD	ST, SPc	C		IS	T		IC, R	13.5	Y	H	L	L	L	
Donoghue A (2010) ³⁵⁷	Resusc	GRS		20	PG	SPc	C		IS	T		C, R	13.5	Y	H	L	U	L	
Egi H (2010) ³⁵⁸	Endosc	Hiroshima University Endoscopic Surgical Assessment Device		37	MS, MD	SPc			T				11.5	N					
Fayez R (2010) ³⁵⁹	Endosc	GI Mentor II		20	PG, MD	ST, SPc			T				12.5	N					
Fero LJ (2010) ³⁶⁰	Nursing	Checklist		36	RN	SPc	C		M				14.5	Y	H	L	U	L	L
Fransson BA (2010) ³⁶¹	MIS., Oth. surg	MISTELS		33	O	ST, SPc			T				14.5	N					
Gale TCE (2010) ³⁶²	Anesth, Nontech	GRS	Single item	224	PG	R, SPc, BP	C	IS	M			IC, C, R	14.5	Y	U	L	U	L	U
Gordon JA (2010) ³⁶³	Resusc, Nontech	GRS	Checklist	17	PG	SPc			IS			R	12.5	N					
Grayeli AB (2010) ³⁶⁴	Open surg	Other:area removed		16	A	SPd			T				12	N					
Greco EF (2010) ³⁶⁵	MIS.	GRS	LapMentor	20	MS, PG	SPc	C	IS				IC, C, R	12.5	Y	H	H	H	L	
Grone J (2010) ³⁶⁶	Open surg	Single item	Counts	48	PG, MD	R, SPd			T				11.5	N					
Hudak SJ (2010) ³⁶⁷	Endosc	SurgicalSim TURP		35	MS, PG, MD	ST, SPc, SPd			T				12.5	N					
Ishman SL (2010) ³⁶⁸	Endosc	GRS		19	PG	R, SPc, BP	C	IS	T			IC, R	13.5	Y	H	U	H	L	
Kallstrom R (2010) ³⁶⁹	Endosc	Checklist	Pelvic Vision (TURP), Single item, Time	20	MS, MD	R, ST, SPc			T				12	N					
Kazemi H (2010) ³⁷⁰	Microsurg	Computer	Time	26	MS, MD, A	ST, SPc, SPd			T				10.5	N					
Kim S (2010) ³⁷¹	Endosc	GI Mentor II		11	PG, MD	R, ST, SPc			T				10.5	N					
Mishra S (2010) ³⁷²	Open surg	Single item	PERC Mentor	27	A	R, SPd							9	N					
Mishra S (2010) ³⁷³	Endosc	UroTrainer		19	PG, MD, A	R							8	N					
Mishra S (2010) ³⁷⁴	Endovasc	PERC Mentor	Counts	56	A	R, ST, SPc, SPd			T				11	N					
Musacchio MJ, Jr (2010) ³⁷⁵	Resusc	Other:		29	MS, PG	R, K							10.5	N					
Nunnink L (2010) ³⁷⁶	Resusc, Intern. med.	Checklist		45	PG	K, SPc			M				13.5	N					
Park CS (2010) ³⁷⁷	Anesth	Checklist		10	PG	SPc	C	IS				IC, R	14.5	Y	U	L	L	L	
Paskins Z (2010) ³⁷⁸	Resusc	Checklist		62	MS, PG	SPc	C	IS	T			IC, R	12.5	Y	H	U	H	L	

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Perosky J (2010) ³⁷⁹	Ob	Counts		135	MD, RN, RN	R, SPc	C		T				13.5	Y	U	L	L	L		
Privett B (2010) ³⁸⁰	Microsurg	EyeSi		23	MS, PG, MD	ST, SPc	C		T				11.5	Y	H	L	L	H		
Ruesseler M (2010) ³⁸¹	Resusc	Checklist		45	MS	R, SPc	C	IS				IC	12.5	Y	L	L	U	L		
Sanchez-Peralta LF (2010) ³⁸²	MIS.	SINERGIA		20	A	R, ST, SPc		IS	T		C	12.5	Y	H	L	L	L			
Sankaranarayanan G (2010) ³⁸³	MIS.	Virtual Basic Laparoscopic Skill Trainer (VBLAST)	MISTELS	50	PG, MD	R, SPc	C		M,T				12	Y	H	L	L	H	U	L
Sarker SK (2010) ³⁸⁴	Endosc	GRS	GI Mentor	55	PG, MD	ST, SPc, BP	C	IS	T		R	14	Y	H	U	H	L			
Sarker SK (2010) ³⁸⁵	MIS.	GRS	LapMentor, Time	28	PG	ST, SPc, BT, BP		IS	T		R	12.5	Y	U	U	L	L			
Schout BMA (2010) ³⁸⁶	Endosc	UroMentor	Counts	80	PG, MD, RN	ST, SPc			T				12.5	N						
Seixas-Mikelus SA (2010) ³⁸⁷	Rob. surg	Other:		30	MD, A	R							8	N						
Serrano-Martínez P (2010) ³⁸⁸	Microsurg	EyeSi		21	PG, MD	ST, SPc			T				10.5	N						
Stewart CM (2010) ³⁸⁹	Endosc	GRS		12	PG	K, SPc	C	IS	T		IC	13	Y	H	U	U	L			
Stovall BA (2010) ³⁹⁰	Exam	Counts		10	MS, MD	SPc		IS			R	12	N							
Tuchschmid S (2010) ³⁹¹	Endosc	OSATS	HystSim	6	A	ST, SPc	C	IS	M		R	13.5	Y	H	L	U	L	L	L	
Tuijthof GJM (2010) ³⁹²	MIS.	Time		28	PG, MD	R, ST			T				11	N						
White MA (2010) ³⁹³	Endosc	OSATS		20	A	R, ST, SPc			T				10.5	N						
Wijn RPWF (2010) ³⁹⁴	MIS.	Xitact / Mentice Laparoscopic nephrectomy		64	MS, PG, MD	R, ST, SPc			T				13	N						
Wilson M (2010) ³⁹⁵	MIS.	Computer	LapMentor	14	A	ST, SPc			T				11.5	N						
Wohaibi EM (2010) ³⁹⁶	MIS.	SurgicalSim Laparoscopic trainer		12	PG	ST, SPc, BP			M				12.5	N						
Yurko YY (2010) ³⁹⁷	MIS.	Other:NASA-TLX	MISTELS, Counts	28	MS	R, SPc, SPd			M				11	N						
Zhang Q (2010) ³⁹⁸	MIS.	Computer	MISTELS, Time	12	PG	ST, SPc			T				10	N						
Zheng B (2010) ³⁹⁹	MIS.	MISTELS		41	PG, MD	K, SPc			T				13	N						
Adler MD (2011) ⁴⁰⁰	Resusc	GRS	Checklist	77	PG	SPc	C	RP	IS	T	C, R	16	Y	L	L	L	L			
Ghaderi I (2011) ⁴⁰¹	MIS.	GOALS		14	PG, MD	SPc, BP			M,T				14	Y	H	L	L	L		
Isenberg GA (2011) ⁴⁰²	Open surg, Venous, Bedside, Exam, Nontech	GRS	Checklist	670	MS	K, SPc		IS	M		IC	13	Y	U	L	U	L	U	L	
Iwata N (2011) ⁴⁰³	MIS.	LapVR		44	PG, MD	ST, SPc			T				11.5	N						
Jayaraman S (2011) ⁴⁰⁴	MIS.	Sensorized Instrument-Based Minimally Invasive Sur	MISTELS, ICSAD	15	PG, MD	ST, SPc	C		M,T				12.5	Y	H	L	L	L		
Kurashima Y (2011) ⁴⁰⁵	MIS.	Other:GOALS-GH	GOALS, Single item	23	PG, MD	SPc, BP	C	IS	M,T		R	14.5	Y	H	L	H	L	H	L	
Le TDB (2011) ⁴⁰⁶	Microsurg	EyeSi		65	MS, PG, MD, O	ST, SPc			T				13.5	N						
Nathoo N (2011) ⁴⁰⁷	Microsurg	EyeSi		10	PG	SPc			T				11.5	N						

Author, year	Topic	Coded instrument	Other instrument	N	Trainee class	Outcomes	Validity Evidence					QUADAS-2 (N=217)					
							Content	Resp Proc	Internal structure	Relations other var.	Conseq.	Reliability	MERSQI	Full	Selection	Flow	Index RoB
Salud LH (2011) ⁴⁰⁸	Endosc	Bronchoscopy Simulator (proprietary)		38	A	ST, SPc			T			11.5	N				
Sankaranarayanan G (2011) ⁴⁰⁹	MIS.	VR-laparoscopic adjustable gastric band		28	MS, PG, MD	R, ST, SPc			T			11	N				
Seixas-Mikelus SA (2011) ⁴¹⁰	Rob. surg	RoSS		42	PG, MD, RN, O	R						8	N				
Soderberg P (2011) ⁴¹¹	Microsurg	PhacoVision		10	MS	ST, SPc			T			6	N				
Stather DR (2011) ⁴¹²	Endosc	AccuTouch Bronchoscopy		22	PG, MD	ST, SPc, SPd			T			12.5	N				
Strickland A (2011) ⁴¹³	MIS.	ProMIS		20	A	ST, SPc			T			11.5	N				
Vaillancourt M (2011) ⁴¹⁴	MIS.	GRS	GOALS, Single item	22	PG, MD	R, SPc	C	IS	M,T	IC, R	14	Y	H	L	H	L	
Weller J (2011) ⁴¹⁵	Resusc, Nontech	GRS		160	MD, RN	SPc	C	IS	T	IC, R	14.5	Y	H	L	H	L	
Fitzpatrick M (2012) ⁴¹⁶	Exam	GRS		20	RN, O	R, K, SPc	C	IS		R	13	Y	U	L	U	L	
O'Donnell JM (2012) ⁴¹⁷	Nursing	Checklist		71	RN	SPc	C	IS		R	13	Y	U	L	U	L	

Abbreviations:

- Topic:** Airway=airway management (intubation, mask ventilation); Anesth=anesthesiology; Bedside=other minimally invasive procedures (thoracentesis, paracentesis, nasogastric tube, etc); Endosc=endoscopy (gastrointestinal, cystoscopy, bronchoscopy, hysteroscopy); Endovasc=endovascular procedures (interventional radiology/cardiology); Intern. med=internal medicine; Microsurg=microsurgery (includes ophthalmology); MIS=minimally invasive surgery; Nontech=nontechnical skills; Ob=obstetrics; Resusc=resuscitation (BLS, ACLS, ATLS, acute care rapid response); surg.=surgery; Venous=venous access.
- Instruments:** GOALS=Global Operative Assessment of Laparoscopic Skills; GRS=global rating scale; ICSAD=Imperial College Surgical Assessment Device; MISTELS=McGill Inanimate System for Training and Evaluation of Laparoscopic Skills; NOTECHS=NOTECHS (a measure of nontechnical skills); OSATS=Objective Structured Assessment of Technical Skill.
- Trainee:** MS=medical student; PG=postgraduate physician in training (resident); MD=physician in practice; RN=nurse or nursing student; D=dentist or dental student; EMT=first responder or first responder student; O=other; A=ambiguous.
- Outcomes:** R=realmism/reaction; K=knowledge; ST=skill-time; SPc=skill-process; SPd=skill product; BT=behavior-time; BP=behavior-process; P=patient effect
- Validity evidence:** C=content; Resp proc. (RP)=response process; IS=internal structure; Relations other var = relations with other variables (M=relations with another measure; T=relations with trainee characteristic e.g. training level); Conseq. (Cq)=consequences. For Reliability: IC=internal consistency, R=inter-rater, C=inter-case, TR=test-retest
- MERSQI** = Medical Education Research Study Quality Inventory (maximum score 18)
- Full**=coded for full review (Y[es]/N[o])
- Quality Assessment of Diagnostic Accuracy Studies, revised (QUADAS-2):** RoB=risk of bias; Appl=application; Ref=reference test. H=high risk of bias / high concern about applicability; L=low; u=unclear.

Supplemental Digital Table 2

List of instruments, sorted by topic (construct) being assessed

Topic (construct)	Trainees	Instrument(s) name or type	Author (year), citation
Airway management	RN	Checklist	Jones T (2002) ⁵⁹
Airway management	PG	Checklist,Time	Scavone BM (2006) ¹⁸³
Airway management	PG	Checklist,Time	Girzadas DV, Jr (2007) ²⁰⁰
Airway management	MD,RN,EMT	Computer,Counts	Rubens AJ (1991) ²
Airway management	MS,PG,MD	Single item	Sudhir G (2007) ²³¹
Airway management	MS,A	Single item,Computer,Time	Cone SW (2008) ²⁵⁶
Airway management	O	Time	Crabtree NA (2008) ²⁵⁷
Airway management	PG,MD,RN	Time,Counts	Hesselfeldt R (2005) ¹³⁶
Airway management	MD,A	Waseda-Kyotokagaku Airway 1R	Noh Y (2008) ²⁸¹
Anesthesia	MS	Checklist	Morgan PJ (2001) ⁴¹
Anesthesia	PG,MD	Checklist	Forrest FC (2002) ⁵⁵
Anesthesia	PG	Checklist	Schwid HA (2002) ⁶⁶
Anesthesia	MS	Checklist	Morgan PJ (2004) ¹⁰⁸
Anesthesia	PG	Checklist	Rosenstock C (2004) ¹¹⁰
Anesthesia	A	Checklist	Morgan PJ (2007) ²¹³
Anesthesia	PG,MD	Checklist	Murray DJ (2007) ²¹⁵
Anesthesia	MD,RN	Checklist	Henrichs BM (2009) ³⁰⁴
Anesthesia	PG	Checklist	Park CS (2010) ³⁷⁷
Anesthesia	MS	Checklist,GRS	Morgan PJ (2001) ⁴⁰
Anesthesia	PG,MD,O	Checklist,GRS	Ottestad E (2007) ²⁷⁸
Anesthesia	PG	Checklist,Time	Lebuffe G (2005) ¹⁴⁰
Anesthesia	PG	Checklist,Time	Scavone BM (2006) ¹⁸³
Anesthesia	PG	Checklist,Time	Waldrop WB (2009) ³³⁵
Anesthesia	PG,MD	Counts,Other	Blum RH (2005) ¹²⁵
Anesthesia	MD	GRS	Devitt JH (1997) ¹⁰
Anesthesia	PG,MD	GRS	Devitt JH (1998) ¹⁷
Anesthesia	MS,PG,MD	GRS	Devitt JH (2001) ³³
Anesthesia	O	GRS	Weller JM (2003) ⁹⁶
Anesthesia	PG	GRS	Berkenstadt H (2005) ¹²⁴
Anesthesia	PG,RN	GRS	Malec JF (2007) ²⁰⁹
Anesthesia	MS	Other	Morgan PJ (2000) ²⁸
Anesthesia	PG,RN	Single item,Checklist	Murray DJ (2005) ¹⁴⁴
Anesthesia	O	Single item,Checklist	Boulet JR (2008) ²⁵²
Anesthesia	PG	Single item,Checklist,Counts	Berkenstadt H (2006) ¹⁵⁷
Anesthesia	PG,MD,RN	Single item,Checklist,GRS	Gaba DM (1998) ¹⁸
Anesthesia	PG	Single item,Checklist,Time	Murray DJ (2004) ¹⁰⁹
Anesthesia	PG	Single item,GRS	Weller JM (2005) ¹⁵³
Anesthesia	PG	Single item,GRS	Savoldelli GL (2006) ¹⁸²
Anesthesia	PG	Single item,GRS	Gale TCE (2010) ³⁶²
Anesthesia	MD	Time,Counts	Byrne AJ (1997) ⁹
Dentistry	D	Computer	Gray SA (2003) ⁸⁰
Dentistry	D	Computer,Time	Suebnukarn S (2009) ³³¹
Dentistry	D	DentSim	Wierinck ER (2007) ²³⁸
Dentistry	D	DentSim,Other	Imber S (2003) ⁸¹
Dentistry	D	GRS	Curtis DA (2007) ¹⁹⁶
Dentistry	D	Other	Kropmans TJB (2004) ¹⁰⁴
Dentistry	D,O	PerioSim	Kolesnikov M (2009) ³⁰⁹
Dentistry	D	Single item	Pippin DJ (1992) ⁴
Dentistry	D	Single item	Sharaf AA (2007) ²²⁷
Endoscopy (GI,Urology,Bronch.)	MS		Kallstrom R (2005) ¹³⁷
Endoscopy (GI,Urology,Bronch.)	PG,MD,RN,O	AccuTouch Bronchoscopy	Ost D (2001) ⁴²
Endoscopy (GI,Urology,Bronch.)	PG,MD	AccuTouch Bronchoscopy	Stather DR (2011) ⁴¹²
Endoscopy (GI,Urology,Bronch.)	PG,MD	AccuTouch Colonoscopy	Sedlack RE (2003) ⁹²
Endoscopy (GI,Urology,Bronch.)	PG	AccuTouch Colonoscopy,GRS,Time	Park J (2007) ²¹⁹
Endoscopy (GI,Urology,Bronch.)	A	Accutouch Endoscopy,GRS	Moorthy K (2004) ¹⁰⁷
Endoscopy (GI,Urology,Bronch.)	PG,MD	Advanced Dundee Endoscopic Psychomotor Tester	Francis NK (2002) ⁵⁶
Endoscopy (GI,Urology,Bronch.)	MS	Basic Performance Resource,GRS	Johnson DB (2004) ¹⁰³

Topic (construct)	Trainees	Instrument(s) name or type	Author (year), citation
Endoscopy (GI,Urology,Bronch.)	A	Bronchoscopy Simulator (proprietary)	Salud LH (2011) ⁴⁰⁸
Endoscopy (GI,Urology,Bronch.)	MS,PG,MD	Checklist,GRS	Davoudi M (2008) ²⁵⁸
Endoscopy (GI,Urology,Bronch.)	PG,MD	Computer	Harders M (2008) ²⁶⁷
Endoscopy (GI,Urology,Bronch.)	MD,A	Computer-Based Bronchoscopy Simulator	Chen J-S (2006) ¹⁶¹
Endoscopy (GI,Urology,Bronch.)	MS,PG,MD	Endoscopic Sinus Surgery Simulator	Fried MP (2007) ¹⁹⁹
Endoscopy (GI,Urology,Bronch.)	MS,PG	Endoscopic Sinus Surgery Simulator, MIST-VR	Arora H (2005) ¹¹⁹
Endoscopy (GI,Urology,Bronch.)	PG,MD	GI Mentor	Ferlitsch A (2002) ⁵⁴
Endoscopy (GI,Urology,Bronch.)	PG,MD	GI Mentor	Felsher JJ (2005) ¹³²
Endoscopy (GI,Urology,Bronch.)	A	GI Mentor II	Ritter EM (2003) ⁹⁰
Endoscopy (GI,Urology,Bronch.)	MS,PG,MD	GI Mentor II	Grantcharov TP (2005) ¹³⁴
Endoscopy (GI,Urology,Bronch.)	PG,MD	GI Mentor II	Enochsson L (2006) ¹⁶⁴
Endoscopy (GI,Urology,Bronch.)	PG,A	GI Mentor II	Koch AD (2008) ²⁷⁰
Endoscopy (GI,Urology,Bronch.)	MD	GI Mentor II	Phitayakorn R (2009) ³¹⁷
Endoscopy (GI,Urology,Bronch.)	PG,MD	GI Mentor II	Bittner JG, IV (2010) ³⁴⁸
Endoscopy (GI,Urology,Bronch.)	PG,MD	GI Mentor II	Fayez R (2010) ³⁵⁹
Endoscopy (GI,Urology,Bronch.)	PG,MD	GI Mentor II	Kim S (2010) ³⁷¹
Endoscopy (GI,Urology,Bronch.)	PG,MD,RN	GI Mentor II (EGD)	Sedlack RE (2007) ²²⁴
Endoscopy (GI,Urology,Bronch.)	A	GI Mentor,GRS	Moorthy K (2004) ¹⁰⁶
Endoscopy (GI,Urology,Bronch.)	PG,MD	GI Mentor,GRS	Sarker SK (2010) ³⁸⁴
Endoscopy (GI,Urology,Bronch.)	MS,PG,MD	GRS	Neumann M (2003) ⁸⁸
Endoscopy (GI,Urology,Bronch.)	PG	GRS	Ishman SL (2010) ³⁶⁸
Endoscopy (GI,Urology,Bronch.)	PG	GRS	Stewart CM (2010) ³⁸⁹
Endoscopy (GI,Urology,Bronch.)	PG,MD,A	GRS,Time	Neumann M (2002) ⁶¹
Endoscopy (GI,Urology,Bronch.)	PG	GRS,Time	Neumann M (2003) ⁸⁷
Endoscopy (GI,Urology,Bronch.)	PG,MD	GRS,Time	von Delius S (2009) ³⁴³
Endoscopy (GI,Urology,Bronch.)	MS,MD	Hiroshima University Endoscopic Surgical Assessment Device	Egi H (2010) ³⁵⁸
Endoscopy (GI,Urology,Bronch.)	MD,A	HT Bronchoscopy simulator	Moorthy K (2003) ⁸⁵
Endoscopy (GI,Urology,Bronch.)	PG,MD	HT Immersion Colonoscopy Simulator	Mahmood T (2003) ⁸⁴
Endoscopy (GI,Urology,Bronch.)	MS,MD	HystSim	Bajka M (2010) ³⁴⁶
Endoscopy (GI,Urology,Bronch.)	PG,MD	ICSAD,Checklist,GRS,Other	Leung RM (2008) ²⁷⁶
Endoscopy (GI,Urology,Bronch.)	PG,A	KAIST-ehwa colonoscopy	Yi SY (2007) ²⁴²
Endoscopy (GI,Urology,Bronch.)	A	MIST-VR, GI Mentor II	Adamsen S (2005) ¹¹⁸
Endoscopy (GI,Urology,Bronch.)	MS,PG,MD,RN	Olympus colonoscopy	Haycock AV (2009) ³⁰³
Endoscopy (GI,Urology,Bronch.)	PG,MD	Olympus Endo TS-1	Koch AD (2008) ²⁷¹
Endoscopy (GI,Urology,Bronch.)	A	OSATS	White MA (2010) ³⁹³

Topic (construct)	Trainees	Instrument(s) name or type	Author (year), citation
Endoscopy (GI,Urology,Bronch.)	PG,MD	OSATS,Accutouch Hysteroscopy,Time	Goff BA (2007) ²⁰¹
Endoscopy (GI,Urology,Bronch.)	A	OSATS,HystSim	Tuchschmid S (2010) ³⁹¹
Endoscopy (GI,Urology,Bronch.)	PG	OSATS,Time	Fialkow M (2007) ¹⁹⁸
Endoscopy (GI,Urology,Bronch.)	PG	OSATS,UroMentor,Other	Matsumoto ED (2006) ¹⁷²
Endoscopy (GI,Urology,Bronch.)	MS,MD	Pelvic Vision (TURP),Single item,Checklist,Time	Kallstrom R (2010) ³⁶⁹
Endoscopy (GI,Urology,Bronch.)	PG,MD	PreOp flexible sigmoidoscopy	Datta V (2002) ⁵³
Endoscopy (GI,Urology,Bronch.)	PG,MD	PreOp flexible sigmoidoscopy	MacDonald J (2003) ⁸³
Endoscopy (GI,Urology,Bronch.)	MS,A	SimEndo	Verdaasdonk EGG (2006) ¹⁸⁷
Endoscopy (GI,Urology,Bronch.)	A	SimEndo	Verdaasdonk EGG (2007) ²³⁶
Endoscopy (GI,Urology,Bronch.)	MS,PG	Single item	Neumann M (2005) ¹⁴⁵
Endoscopy (GI,Urology,Bronch.)	MS,PG,MD	SurgicalSim TURP	Hudak SJ (2010) ³⁶⁷
Endoscopy (GI,Urology,Bronch.)	PG,MD	Time	Leung JW (2007) ²⁰⁷
Endoscopy (GI,Urology,Bronch.)	O	Time	Crabtree NA (2008) ²⁵⁷
Endoscopy (GI,Urology,Bronch.)	PG,MD,O	Time,Counts	Sedlack RE (2007) ²²⁵
Endoscopy (GI,Urology,Bronch.)	PG,MD	Time,Counts	Volsky PG (2009) ³³⁴
Endoscopy (GI,Urology,Bronch.)	PG,MD,A	TURP simulator (proprietary)	Rashid HH (2007) ²²⁰
Endoscopy (GI,Urology,Bronch.)	MD,A	University of Washington TURP Simulator	Sweet R (2004) ¹¹⁶
Endoscopy (GI,Urology,Bronch.)	PG	Upper GI Endoscopy Simulator	Bloom MB (2003) ⁷⁴
Endoscopy (GI,Urology,Bronch.)	MS,PG,MD	UroMentor	Shah J (2002) ⁶⁷
Endoscopy (GI,Urology,Bronch.)	PG,MD,RN,A	UroMentor	Gettman MT (2008) ²⁶²
Endoscopy (GI,Urology,Bronch.)	PG,MD	UroMentor	Dolmans VEMG (2009) ³⁰¹
Endoscopy (GI,Urology,Bronch.)	PG,MD,RN	UroMentor,Counts	Schout BMA (2010) ³⁸⁶
Endoscopy (GI,Urology,Bronch.)	PG,MD	UroTrainer	Schout BMA (2009) ³²⁴
Endoscopy (GI,Urology,Bronch.)	PG,MD,A	UroTrainer	Mishra S (2010) ³⁷³
Endovascular procedures	PG,MD	AngioMentor	Duncan JR (2007) ¹⁹⁷
Endovascular procedures	PG,MD,O	Checklist,GRS	Berger P (2010) ³⁴⁷
Endovascular procedures	A	GRS,Time	Gould DA (2006) ¹⁶⁵
Endovascular procedures	PG,MD	OSATS,ICEPS,GRS,Time	Willems MCM (2009) ³³⁸
Endovascular procedures	MS,PG,MD,O,A	OSATS,VIST,GRS,Time	Hislop SJ (2006) ¹⁶⁶
Endovascular procedures	A	PERC Mentor,Counts	Mishra S (2010) ³⁷⁴
Endovascular procedures	MS,PG,MD,O,A	VIST	Hsu JH (2004) ¹⁰²
Endovascular procedures	MD	VIST	Aggarwal R (2006) ¹⁵⁴
Endovascular procedures	MS,MD	VIST	Berry M (2006) ¹⁵⁸
Endovascular procedures	MD	VIST	Nicholson WJ (2006) ¹⁷⁸
Endovascular procedures	MD	VIST	Patel AD (2006) ¹⁸⁰
Endovascular procedures	MD	VIST	Van Herzele I (2007) ²³⁴
Endovascular procedures	MS,MD	VIST	Berry M (2008) ²⁴⁸
Endovascular procedures	PG,MD	VIST	Glaiberman CB (2008) ²⁶³
Endovascular procedures	PG,MD	VIST	Van Herzele I (2008) ²⁸⁸
Endovascular procedures	A	VIST	Willoteaux S (2009) ³⁴⁰
Endovascular procedures	PG,MD	VIST	Coates PJB (2010) ³⁵⁴
Endovascular procedures	MD	VIST,GRS,Counts	Van Herzele I (2009) ³³³
Internal medicine	MS	Checklist	Rogers PL (2001) ⁴⁶
Internal medicine	PG	Checklist	Nunnink L (2010) ³⁷⁶
Internal medicine	MS	Checklist,GRS	Wright MC (2009) ³⁴¹

Topic (construct)	Trainees	Instrument(s) name or type	Author (year), citation
Internal medicine	MS	Checklist,Other	Bergus G (2006) ¹⁵⁶
Microsurgery/Ophthalmology	PG,MD	Computer	Saleh GM (2009) ³²⁰
Microsurgery/Ophthalmology	A	Computer,Time	Saleh GM (2008) ²⁸²
Microsurgery/Ophthalmology	MS,MD,A	Computer,Time	Kazemi H (2010) ³⁷⁰
Microsurgery/Ophthalmology	MS,PG,MD	EyeSi	Rossi JV (2004) ¹¹¹
Microsurgery/Ophthalmology	PG,MD	EyeSi	Mahr MA (2008) ²⁷⁷
Microsurgery/Ophthalmology	PG,MD	EyeSi	Solverson DJ (2009) ³²⁹
Microsurgery/Ophthalmology	MS,PG,MD	EyeSi	Privett B (2010) ³⁸⁰
Microsurgery/Ophthalmology	PG,MD	EyeSi	Serrano-Martínez P (2010) ³⁸⁸
Microsurgery/Ophthalmology	MS,PG,MD,O	EyeSi	Le TDB (2011) ⁴⁰⁶
Microsurgery/Ophthalmology	PG	EyeSi	Nathoo N (2011) ⁴⁰⁷
Microsurgery/Ophthalmology	MS,PG,MD	GRS,Time	Contag SP (2009) ³⁰⁰
Microsurgery/Ophthalmology	MS	PhacoVision	Soderberg P (2011) ⁴¹¹
Minimally invasive surgery	PG	Advanced Dundee Endoscopic Psychomotor Tester	Macmillan AI (1999) ²²
Minimally invasive surgery	PG,MD	Advanced Dundee Endoscopic Psychomotor Tester,Other	Schijven MP (2002) ⁶⁵
Minimally invasive surgery	PG,MD	Checklist,GRS	Insel A (2009) ³⁰⁶
Minimally invasive surgery	PG,MD	Checklist,Time	Dayan AB (2008) ²⁵⁹
Minimally invasive surgery	A	Computer	Richards C (2000) ²⁹
Minimally invasive surgery	A	Computer	Sokollik C (2004) ¹¹³
Minimally invasive surgery	A	Computer	Howells NR (2008) ²⁶⁹
Minimally invasive surgery	PG,MD	Computer	Tashiro Y (2009) ³³²
Minimally invasive surgery	MS,PG,MD	Computer	Allen B (2010) ³⁴⁵
Minimally invasive surgery	PG,MD	Computer,Time,Other	Rosen J (2001) ⁴⁷
Minimally invasive surgery	A	Computer-Enhanced Laparoscopic Training System	Stylopoulos N (2004) ¹¹⁵
Minimally invasive surgery	A	EndoTower	Haluck RS (2002) ⁵⁸
Minimally invasive surgery	PG,MD,A	EndoTower with Virtual Laparoscopic Interface,GRS,Time	Stefanidis D (2007) ²²⁹
Minimally invasive surgery	PG,MD	GOALS	Ghaderi I (2011) ⁴⁰¹
Minimally invasive surgery	PG,MD	GOALS,Single item,GRS	Vaillancourt M (2011) ⁴¹⁴
Minimally invasive surgery	PG,MD	GOALS,Single item,Other	Kurashima Y (2011) ⁴⁰⁵
Minimally invasive surgery	PG	GRS,Time	Lentz GM (2001) ³⁸
Minimally invasive surgery	MS,MD	Hiroshima University Endoscopic Surgical Assessment Device	Egi H (2008) ²⁶⁰
Minimally invasive surgery	PG,MD	ICSAD	Smith SG (2002) ⁶³
Minimally invasive surgery	A	ICSAD,Checklist	Moorthy K (2004) ¹⁰⁵
Minimally invasive surgery	A	LapMentor	Ayodeji ID (2006) ¹⁵⁵
Minimally invasive surgery	MS,PG,MD	LapMentor	McDougall EM (2006) ¹⁷⁴
Minimally invasive surgery	PG,MD,A	LapMentor	Ayodeji ID (2007) ¹⁹²
Minimally invasive surgery	A	LapMentor	Yamaguchi S (2007) ²⁴¹
Minimally invasive surgery	MS,PG,MD,A	LapMentor	Andreatta PB (2008) ²⁴⁶
Minimally invasive surgery	MS,PG,A	LapMentor	Zhang A (2008) ²⁹⁰
Minimally invasive surgery	PG,MD	LapMentor	Kössi J (2009) ³¹¹
Minimally invasive surgery	MD	LapMentor, LapSim, LTS2000, ProMIS, Surgical SIM	Heinrichs WL (2007) ²⁰³
Minimally invasive surgery	A	LapMentor,Computer	Wilson M (2010) ³⁹⁵
Minimally invasive surgery	MS,PG	LapMentor,GRS	Greco EF (2010) ³⁶⁵
Minimally invasive surgery	PG	LapMentor,GRS,Time	Sarker SK (2010) ³⁸⁵
Minimally invasive surgery	PG,MD	LapSim	Duffy AJ (2005) ¹³⁰
Minimally invasive surgery	A	LapSim	Eriksen JR (2005) ¹³¹
Minimally invasive surgery	PG,MD	LapSim	Ro CY (2005) ¹⁴⁶
Minimally invasive surgery	MS,PG,MD	LapSim	Sherman V (2005) ¹⁴⁸
Minimally invasive surgery	PG,MD	LapSim	Larsen CR (2006) ¹⁶⁹
Minimally invasive surgery	MS,PG,MD	LapSim	Woodrum DT (2006) ¹⁸⁸
Minimally invasive surgery	PG,A	LapSim	Ahlberg G (2007) ¹⁹¹
Minimally invasive surgery	MS	LapSim	Hogle NJ (2007) ²⁰⁵
Minimally invasive surgery	MS,PG,MD	LapSim	van Dongen KW (2007) ²⁴⁵
Minimally invasive surgery	PG	LapSim	Kundhal PS (2009) ³¹⁰
Minimally invasive surgery	PG	LapSim	Salgado J (2009) ³²¹
Minimally invasive surgery	MS,PG,MD	LapSim	Schreuder HW (2009) ³²⁵
Minimally invasive surgery	MS	LapSim,Time,Counts	Newmark J (2007) ²¹⁶
Minimally invasive surgery	PG,MD	LapVR	Iwata N (2011) ⁴⁰³
Minimally invasive surgery	MS,PG,MD	MIST Nephrectomy	Brewin J (2010) ³⁵⁰
Minimally invasive surgery	PG,MD	MISTELS	Derossis AM (1998) ¹⁶
Minimally invasive surgery	MS,PG,MD	MISTELS	Fraser SA (2003) ⁷⁶
Minimally invasive surgery	PG	MISTELS	Feldman LS (2004) ⁹⁸
Minimally invasive surgery	PG,MD	MISTELS	Fried GM (2004) ⁹⁹
Minimally invasive surgery	PG,MD	MISTELS	Dauster B (2005) ¹²⁸
Minimally invasive surgery	PG,MD	MISTELS	Fichera A (2005) ¹³³
Minimally invasive surgery	PG,MD	MISTELS	Swanstrom LL (2006) ¹⁸⁵
Minimally invasive surgery	MS,PG,MD	MISTELS	Vassiliou MC (2006) ¹⁸⁶

Topic (construct)	Trainees	Instrument(s) name or type	Author (year), citation
Minimally invasive surgery	PG,MD	MISTELS	McCluney AL (2007) ²¹¹
Minimally invasive surgery	MS,MD	MISTELS	Kolkman W (2008) ²⁷²
Minimally invasive surgery	O	MISTELS	Fransson BA (2010) ³⁶¹
Minimally invasive surgery	PG,MD	MISTELS	Zheng B (2010) ³⁹⁹
Minimally invasive surgery	PG	MISTELS,Computer,Time	Zhang Q (2010) ³⁹⁸
Minimally invasive surgery	MS	MISTELS,Counts,Other	Yurko YY (2010) ³⁹⁷
Minimally invasive surgery	PG,MD	MISTELS,ICSAD	Xeroulis G (2009) ³⁴²
Minimally invasive surgery	MS,PG,MD	MISTELS,LTS-2000	Sansregret A (2009) ³²³
Minimally invasive surgery	MS,PG	MISTELS,MIST-VR	Avgerinos DV (2005) ¹²⁰
Minimally invasive surgery	MS,PG,MD	MISTELS,ProMIS	Ritter EM (2007) ²²²
Minimally invasive surgery	PG,MD	MISTELS,Sensorized Instrument-Based Minimally Invasive Surgery (SIMIS),ICSAD	Jayaraman S (2011) ⁴⁰⁴
Minimally invasive surgery	PG	MISTELS,Time,Counts	Fried GM (1999) ²¹
Minimally invasive surgery	A	MISTELS,Virtual Basic Laparoscopic Skill Trainer (VBLaST)	Sankaranarayanan G (2009) ³²²
Minimally invasive surgery	PG,MD	MISTELS,Virtual Basic Laparoscopic Skill Trainer (VBLaST)	Sankaranarayanan G (2010) ³⁸³
Minimally invasive surgery	PG,MD,A	MIST-VR	Taffinder N (1998) ²⁰
Minimally invasive surgery	A	MIST-VR	Gallagher AG (2002) ⁵⁷
Minimally invasive surgery	A	MIST-VR	Grantcharov TP (2003) ⁷⁹
Minimally invasive surgery	MS	MIST-VR	Gallagher AG (2004) ¹⁰⁰
Minimally invasive surgery	MD	MIST-VR	Van Sickle KR (2007) ²³⁵
Minimally invasive surgery	MS,PG,MD	MIST-VR	Moore AK (2008) ²⁷⁹
Minimally invasive surgery	PG,MD	MIST-VR, EndoTower, CELTS	Maithel S (2006) ¹¹¹
Minimally invasive surgery	A	MIST-VR, GI Mentor II	Adamsen S (2005) ¹¹⁸
Minimally invasive surgery	PG,MD	MIST-VR, modified platform	McNatt SS (2001) ³⁹
Minimally invasive surgery	MS,PG,MD	MIST-VR,Checklist,Time,Counts,Other	Paisley AM (2001) ⁴³
Minimally invasive surgery	MD	MIST-VR,Counts	Gallagher AG (2003) ⁷⁷
Minimally invasive surgery	PG	MIST-VR,GRS	Grantcharov TP (2001) ³⁶
Minimally invasive surgery	MS	MIST-VR,GRS	Ahlberg G (2002) ⁵¹
Minimally invasive surgery	MS	MIST-VR,GRS,Time	Madan AK (2005) ¹⁴¹
Minimally invasive surgery	PG	MIST-VR,ICSAD,Single item,GRS,Time,Other	Bann S (2003) ⁷²
Minimally invasive surgery	PG	MIST-VR,Time	Stefanidis D (2005) ¹⁴⁹
Minimally invasive surgery	PG,MD	MIST-VR,Time,Counts,Other	Uchal M (2005) ¹⁵¹
Minimally invasive surgery	MD	NOTECHS,GRS,Time,Counts	Powers K (2009) ³¹⁸
Minimally invasive surgery	PG	OSATS,MIST-VR,ICSAD,Other	Bann S (2005) ¹²¹
Minimally invasive surgery	PG	OSATS,ProMIS	Broe D (2006) ¹⁶⁰
Minimally invasive surgery	MS,PG,MD	OSATS,ProMIS,Counts	Pellen M (2009) ³¹⁵
Minimally invasive surgery	PG	OSATS,Time	Goff BA (2001) ³⁵
Minimally invasive surgery	MS,MD	Procedicus Virtual Arthroscopy	Smith S (1999) ²⁶
Minimally invasive surgery	MS,PG,MD,A	Procedicus Virtual Arthroscopy	Srivastava S (2004) ¹¹⁴
Minimally invasive surgery	MS,PG,MD	Procedicus Virtual Arthroscopy	Gomoll AH (2007) ²⁰²
Minimally invasive surgery	PG	Procedicus Virtual Arthroscopy	Gomoll AH (2008) ²⁶⁴
Minimally invasive surgery	MS,PG,MD	ProMIS	Van Sickle KR (2005) ¹⁵²
Minimally invasive surgery	PG,MD	ProMIS	Botden SMBI (2008) ²⁵⁰
Minimally invasive surgery	PG,MD	ProMIS	Botden SMBI (2008) ²⁵¹
Minimally invasive surgery	PG	ProMIS	Feifer A (2008) ²⁸¹
Minimally invasive surgery	MS,PG	ProMIS	Stefanidis D (2009) ³³⁰
Minimally invasive surgery	A	ProMIS	Strickland A (2011) ⁴¹³
Minimally invasive surgery	PG,MD	ProMIS, LapSim	Botden SMBI (2007) ¹⁹⁴
Minimally invasive surgery	MD	ProMIS,Counts	Neary PC (2008) ²⁸⁰
Minimally invasive surgery	MS,PG,MD	ProMIS,Counts	Pellen MG (2009) ³¹⁶
Minimally invasive surgery	A	ProMIS,GRS,Other	Botden SMBI (2009) ²⁹⁵
Minimally invasive surgery	MS,PG,MD	ProMIS,Single item	Chandra V (2010) ³⁵³
Minimally invasive surgery	PG	ProMIS,Single item,Time,Other	Cesaneck P (2008) ²⁵⁵
Minimally invasive surgery	PG,MD,A	Sheffield Knee Arthroscopy Training System	McCarthy A (1999) ²³
Minimally invasive surgery	PG,MD	Sheffield Knee Arthroscopy Training System	McCarthy AD (2006) ¹⁷³
Minimally invasive surgery	A	SINERGIA	Sanchez-Peralta LF (2010) ³⁸²
Minimally invasive surgery	MS,PG,MD	Single item,Checklist,GRS,Time	Adrales GL (2003) ⁷⁰
Minimally invasive surgery	MS,PG,MD	Single item,GRS	Adrales GL (2003) ⁶⁹
Minimally invasive surgery	PG,MD,A	Single item,Time,Other	Stefanidis D (2007) ²³⁰
Minimally invasive surgery	A	Skills Assessment Device	Smith CD (2001) ⁴⁹
Minimally invasive surgery	MS,MD	SurgicalSim Laparoscopic trainer	Mathis KL (2007) ²¹⁰
Minimally invasive surgery	PG	SurgicalSim Laparoscopic trainer	Wohaibi EM (2010) ³⁹⁶
Minimally invasive surgery	PG	Time	Chung JY (1998) ¹⁵
Minimally invasive surgery	PG,MD	Time	Katz R (2005) ¹³⁸

Topic (construct)	Trainees	Instrument(s) name or type	Author (year), citation
Minimally invasive surgery	MS,PG,MD	Time	Korndorffer JR, Jr. (2005) ¹³⁹
Minimally invasive surgery	PG	Time	Black M (2006) ¹⁵⁹
Minimally invasive surgery	PG,MD	Time	Sugiono M (2007) ²³²
Minimally invasive surgery	MS,PG	Time	Arden D (2008) ²⁴⁷
Minimally invasive surgery	PG,MD	Time	Tuijthof GJM (2010) ³⁹²
Minimally invasive surgery	MS	Time,Counts	Madan AK (2005) ¹⁴²
Minimally invasive surgery	PG,MD	Time,Counts	Sereno-Trabaldo S (2005) ¹⁴⁷
Minimally invasive surgery	MS,PG	Time,Counts	Boon JR (2008) ²⁴⁹
Minimally invasive surgery	MS,PG,MD	Time,Counts	Molinis CR (2008) ²⁷⁸
Minimally invasive surgery	MS,PG,MD	Time,Counts	Van Sickle KR (2008) ²⁸⁹
Minimally invasive surgery	PG,MD	Time,Counts	Campo R (2010) ³⁵¹
Minimally invasive surgery	MS,PG,MD,A	Time,Other,Other	Zheng B (2008) ²⁹¹
Minimally invasive surgery	A	UCLA Laparoscopic Training System	Nistor V (2007) ²¹⁷
Minimally invasive surgery	PG	Virtual Environment Knee Arthroscopy Training System	Sherman KP (2001) ⁴⁸
Minimally invasive surgery	MS,PG,MD	Virtual Laparoscopic Interface	Haluck RS (2001) ³⁷
Minimally invasive surgery	A	Virtual Laparoscopic Interface	Sung WH (2003) ⁹³
Minimally invasive surgery	PG,MD	Virtual Laparoscopic Interface,Other	Cotin S (2002) ⁵²
Minimally invasive surgery	MS,PG,MD	VR-laparoscopic adjustable gastric band	Sankaranarayanan G (2011) ⁴⁰⁹
Minimally invasive surgery	MS,PG,MD	Xitact / Mentice Laparoscopic nephrectomy	Wijn RPWF (2010) ³⁹⁴
Minimally invasive surgery	PG,MD	Xitact LS500	Schijven M (2002) ⁶⁴
Minimally invasive surgery	PG,MD	Xitact LS500	Schijven M (2003) ⁹¹
Minimally invasive surgery	PG	Xitact LS500	Schijven MP (2004) ¹¹²
Minimally invasive surgery	MS	Xitact LS500	Rosenthal R (2006) ¹⁸¹
Minimally invasive surgery	PG	Xitact LS500,Single item	Rosenthal R (2007) ²²³
Minimally invasive surgery	A	Xitact, SimPack	Buzink SN (2009) ²⁹⁷
Nontechnical skills	PG	Checklist	Gisondi MA (2004) ¹⁰¹
Nontechnical skills	PG	Checklist	Rosenstock C (2004) ¹¹⁰
Nontechnical skills	RN	Checklist	Todd M (2008) ²⁸⁶
Nontechnical skills	PG,MD	Checklist,Counts	Tsai T-C (2003) ⁹⁵
Nontechnical skills	MS	Checklist,GRS	Weller J (2004) ¹¹⁷
Nontechnical skills	PG,MD,O	Checklist,GRS	Ottestad E (2007) ²¹⁸
Nontechnical skills	PG	Checklist,GRS	Williams JB (2009) ³³⁹
Nontechnical skills	MS	Checklist,GRS	Wright MC (2009) ³⁴¹
Nontechnical skills	PG	Checklist,GRS	Gordon JA (2010) ³⁶³
Nontechnical skills	MS	Checklist,GRS	Isenberg GA (2011) ⁴⁰²
Nontechnical skills	MS	Checklist,Other	Bergus G (2006) ¹⁵⁶
Nontechnical skills	PG	Counts	Chalabian J (1998) ¹⁴
Nontechnical skills	O	GRS	Weller JM (2003) ⁹⁶
Nontechnical skills	PG	GRS	Kim J (2006) ¹⁶⁷
Nontechnical skills	PG,RN	GRS	Malec JF (2007) ²⁰⁹
Nontechnical skills	PG	GRS	Brewster LP (2008) ²⁵⁴
Nontechnical skills	O	GRS	Guise J-M (2008) ²⁶⁶
Nontechnical skills	PG	GRS	Kim J (2009) ³⁰⁸
Nontechnical skills	EMT	GRS	von Wyl T (2009) ³⁴⁴
Nontechnical skills	MD,RN	GRS	Weller J (2011) ⁴¹⁵
Nontechnical skills	MS,PG	IPPI,Checklist,GRS	LeBlanc VR (2009) ³¹³
Nontechnical skills	A	NOTECHS	Sevdalis N (2008) ²⁸³
Nontechnical skills	MD	NOTECHS,GRS,Time,Counts	Powers K (2009) ³¹⁸
Nontechnical skills	PG	OSATS,ICEPS,Checklist,GRS,Counts	Moorthy K (2005) ¹⁴³
Nontechnical skills	PG,MD	OSATS,ICEPS,NOTECHS	Black SA (2010) ³⁴⁹
Nontechnical skills	PG	OSATS,NOTECHS,Counts,Other	Moorthy K (2006) ¹⁷⁶
Nontechnical skills	PG,MD,RN	Single item,Checklist,GRS	Gaba DM (1998) ¹⁸
Nontechnical skills	PG,MD,RN	Single item,GRS	Morgan PJ (2007) ²¹⁴
Nontechnical skills	MS,RN	Single item,GRS	Cooper S (2010) ³⁵⁵
Nontechnical skills	PG	Single item,GRS	Gale TCE (2010) ³⁶²
Nontechnical skills	MS,PG,MD,A	Time,Other,Other	Zheng B (2008) ²⁹¹
Nursing	RN	Checklist	Jones T (2002) ⁵⁹
Nursing	RN	Checklist	Todd M (2008) ²⁸⁶
Nursing	RN	Checklist	Fero LJ (2010) ³⁶⁰
Nursing	RN	Checklist	O'Donnell JM (2012) ⁴¹⁷
Nursing	RN	GRS,Other	Sevdalis N (2009) ³²⁷
Obstetrics	PG,MD	Computer	Dupuis O (2006) ¹⁶³
Obstetrics	PG	Computer	Moreau R (2007) ²¹²
Obstetrics	MD,RN,RN	Counts	Perosky J (2010) ³⁷⁹
Obstetrics	PG,MD,O	GRS	Crofts JF (2005) ¹²⁶

Topic (construct)	Trainees	Instrument(s) name or type	Author (year), citation
Obstetrics	O	GRS	Guise J-M (2008) ²⁶⁶
Obstetrics	PG	OSATS	Nielsen PE (2003) ⁸⁹
Obstetrics	PG	OSATS	Siddighi S (2007) ²²⁸
Obstetrics	PG	OSATS,Time	Siddiqui NY (2008) ²⁸⁵
Obstetrics	MS,PG	Other	Murphy AA (2003) ⁸⁶
Obstetrics	PG,MD,RN	Single item,GRS	Morgan PJ (2007) ²¹⁴
Open surgery/suturing	PG	Checklist	Beard JD (2005) ¹²²
Open surgery/suturing	MD	Checklist	Beard JD (2005) ¹²³
Open surgery/suturing	PG	Checklist	Butler NN (2007) ¹⁹⁵
Open surgery/suturing	PG	Checklist	Carroll SM (2009) ²⁹⁸
Open surgery/suturing	MS	Checklist,GRS	Isenberg GA (2011) ⁴⁰²
Open surgery/suturing	MS,MD	Computer,Time	O'Toole RV (1999) ²⁴
Open surgery/suturing	PG,MD	Computer,Time	Dubrowski A (2005) ¹²⁹
Open surgery/suturing	PG,MD	Computer,Time,Other,Other	Woodrow SI (2007) ²⁴⁰
Open surgery/suturing	PG	GRS	Tytherleigh MG (2001) ⁵⁰
Open surgery/suturing	PG	GRS	Brewster LP (2008) ²⁵⁴
Open surgery/suturing	MS,PG,MD	GRS	Shippey S (2009) ³²⁸
Open surgery/suturing	MS,PG,MD	GRS,Other	Torgerson CS (2007) ²³³
Open surgery/suturing	PG	GRS,Time	Lentz GM (2001) ³⁸
Open surgery/suturing	PG,MD	ICSAD	Datta V (2001) ³²
Open surgery/suturing	PG,A	ICSAD	Bann SD (2003) ⁷³
Open surgery/suturing	MS	ICSAD,Single item,Other	Brydges R (2009) ²⁹⁶
Open surgery/suturing	MS,PG	IPPI,Checklist,GRS	LeBlanc VR (2009) ³¹³
Open surgery/suturing	PG,A	Mastoidectomy simulator,Single item,GRS	Sewell C (2007) ²²⁶
Open surgery/suturing	MS,PG,MD	MIST-VR,Checklist,Time,Counts,Other	Paisley AM (2001) ⁴³
Open surgery/suturing	PG	MIST-VR,ICSAD,Single item,GRS,Time,Other	Bann S (2003) ⁷²
Open surgery/suturing	A	NOTECHS	Sevdalis N (2008) ²⁸³
Open surgery/suturing	PG	OSATS	Faulkner H (1996) ⁷
Open surgery/suturing	PG	OSATS	Martin JA (1997) ¹²
Open surgery/suturing	PG	OSATS	Reznick R (1997) ¹³
Open surgery/suturing	PG	OSATS	Ault G (2001) ³¹
Open surgery/suturing	PG	OSATS	Friedlich M (2001) ³⁴
Open surgery/suturing	PG,MD	OSATS	Datta V (2004) ⁹⁷
Open surgery/suturing	PG,MD	OSATS	Hance J (2005) ¹³⁵
Open surgery/suturing	PG	OSATS	Shah J (2006) ¹⁸⁴
Open surgery/suturing	PG	OSATS	Siddighi S (2007) ²²⁸
Open surgery/suturing	PG	OSATS	Chipman JG (2009) ²⁹⁹
Open surgery/suturing	PG	OSATS,GRS	Regehr G (1998) ¹⁹
Open surgery/suturing	PG	OSATS,GRS,Time	Szalay D (2000) ³⁰
Open surgery/suturing	PG	OSATS,ICEPS,Checklist,GRS,Counts	Moorthy K (2005) ¹⁴³
Open surgery/suturing	PG,MD	OSATS,ICEPS,NOTECHS	Black SA (2010) ³⁴⁹
Open surgery/suturing	PG,MD	OSATS,ICEPS,Single item,Computer	Pandey VA (2006) ¹⁷⁹
Open surgery/suturing	MS,PG,MD	OSATS,ICSAD	Khan MS (2003) ⁸²
Open surgery/suturing	PG,MD	OSATS,ICSAD	Khan MS (2007) ²⁰⁶
Open surgery/suturing	PG,MD	OSATS,ICSAD,ICEPS,Single item,GRS	Black SA (2007) ¹⁹³
Open surgery/suturing	PG,MD	OSATS,ICSAD,Single item,Other	Datta V (2006) ¹⁶²
Open surgery/suturing	PG,MD	OSATS,ICSAD,Time	Leong JJ (2008) ²⁷⁵
Open surgery/suturing	PG	OSATS,MIST-VR,ICSAD,Other	Bann S (2005) ¹²¹
Open surgery/suturing	PG	OSATS,NOTECHS,Counts,Other	Moorthy K (2006) ¹⁷⁶
Open surgery/suturing	PG	OSATS,Time	Goff BA (2001) ³⁵
Open surgery/suturing	PG	OSATS,Time	Fialkow M (2007) ¹⁹⁸
Open surgery/suturing	PG	OSATS,Time	Siddiqui NY (2008) ²⁸⁵
Open surgery/suturing	PG	Other	Bann S (2003) ⁷¹
Open surgery/suturing	A	Other	Gravely AB (2010) ³⁶⁴
Open surgery/suturing	A	PERC Mentor,Single item	Mishra S (2010) ³⁷²
Open surgery/suturing	PG,MD,A	Single item	Morris D (2006) ¹⁷⁷
Open surgery/suturing	PG	Single item,Checklist,GRS,Other	Zirkle M (2007) ²⁴⁴
Open surgery/suturing	PG,MD,A	Single item,Computer,Other	Sewell C (2008) ²⁸⁴
Open surgery/suturing	PG	Single item,Computer,Time	Zirkle M (2007) ²⁴³
Open surgery/suturing	PG,MD	Single item,Counts	Grone J (2010) ³⁶⁶
Open surgery/suturing	MS,PG,MD	Time,Counts	Chapman DM (1994) ⁵
Open surgery/suturing	MS,PG,MD	Time,Counts	Chapman DM (1996) ^b
Open surgery/suturing	PG	Time,Counts	Wilasrusmee C (2007) ²³⁹
Open surgery/suturing	PG,MD	Time,Counts	Goova MT (2008) ²⁶⁵
Open surgery/suturing	PG,MD	Time,Other	Vick LR (2007) ²³⁷
Open surgery/suturing	PG	Xitact LS500,Single item	Rosenthal R (2007) ²²³
Other bedside procedures	MS	Checklist,GRS	Isenberg GA (2011) ⁴⁰²
Other bedside procedures	PG	GRS	Stitik TP (2005) ¹⁵⁰

Topic (construct)	Trainees	Instrument(s) name or type	Author (year), citation
Physical exam	MS	Checklist,GRS	Isenberg GA (2011) ⁴⁰²
Physical exam	MS,PG	Computer,Time,Other	Balkissoon R (2009) ²⁹⁴
Physical exam	PG	Counts	Chalabian J (1998) ¹⁴
Physical exam	MS	Counts	McKenzie FD (2006) ¹⁷⁵
Physical exam	PG,MD	Counts	Langley RGB (2009) ³¹²
Physical exam	MS,MD	Counts	Stovall BA (2010) ³⁹⁰
Physical exam	MS,A	e-Pelvis	Mackel TR (2007) ²⁰⁸
Physical exam	MS,MD	e-Pelvis,Other	Pugh CM (2001) ⁴⁵
Physical exam	MS	e-Pelvis,Other	Pugh CM (2002) ⁶²
Physical exam	MD	GRS	Hatala R (2008) ²⁶⁸
Physical exam	RN,O	GRS	Fitzpatrick M (2012) ⁴¹⁶
Physical exam	PG	Single item,Checklist,GRS,Other	Hatala R (2009) ³⁰²
Radiology/other noninvasive dx	PG,MD,O	GRS	Weidenbach M (2009) ³³⁷
Radiology/other noninvasive dx	PG,MD	Time	Leung JW (2007) ²⁰⁷
Radiology/other noninvasive dx	PG	Time,Other	Terkamp C (2003) ⁹⁴
Resuscitation (BLS,ACLS,ATLS)	MS	Checklist	Rogers PL (2001) ⁴⁶
Resuscitation (BLS,ACLS,ATLS)	MS,PG	Checklist	Boulet JR (2003) ⁷⁵
Resuscitation (BLS,ACLS,ATLS)	PG	Checklist	Gisondi MA (2004) ¹⁰¹
Resuscitation (BLS,ACLS,ATLS)	PG	Checklist	van der Heide PA (2006) ¹⁸⁹
Resuscitation (BLS,ACLS,ATLS)	PG	Checklist	Adler MD (2007) ¹⁹⁰
Resuscitation (BLS,ACLS,ATLS)	EMT	Checklist	Hemman EA (2007) ²⁰⁴
Resuscitation (BLS,ACLS,ATLS)	PG	Checklist	Brett-Fleegler MB (2008) ²⁵³
Resuscitation (BLS,ACLS,ATLS)	PG	Checklist	Adler MD (2009) ²⁹²
Resuscitation (BLS,ACLS,ATLS)	O	Checklist	Weeks DL (2009) ³³⁶
Resuscitation (BLS,ACLS,ATLS)	PG	Checklist	Nunnink L (2010) ³⁷⁶
Resuscitation (BLS,ACLS,ATLS)	MS,PG	Checklist	Paskins Z (2010) ³⁷⁸
Resuscitation (BLS,ACLS,ATLS)	MS	Checklist	Ruesseler M (2010) ³⁸¹
Resuscitation (BLS,ACLS,ATLS)	PG,RN	Checklist,Computer	Mancini ME (1990) ¹
Resuscitation (BLS,ACLS,ATLS)	PG,MD	Checklist,Counts	Tsai T-C (2003) ⁹⁵
Resuscitation (BLS,ACLS,ATLS)	MS,PG	Checklist,GRS	Murray D (2002) ⁶⁰
Resuscitation (BLS,ACLS,ATLS)	MS	Checklist,GRS	Weller J (2004) ¹¹⁷
Resuscitation (BLS,ACLS,ATLS)	PG,MD,O	Checklist,GRS	Ottestad E (2007) ²¹⁸
Resuscitation (BLS,ACLS,ATLS)	PG	Checklist,GRS	Williams JB (2009) ³³⁹
Resuscitation (BLS,ACLS,ATLS)	MS,PG,RN	Checklist,GRS	Casabella Abril B (2010) ³⁵²
Resuscitation (BLS,ACLS,ATLS)	PG	Checklist,GRS	Gordon JA (2010) ³⁶³
Resuscitation (BLS,ACLS,ATLS)	PG	Checklist,GRS	Adler MD (2011) ⁴⁰⁰
Resuscitation (BLS,ACLS,ATLS)	A	Checklist,Other	Nahigian E (1996) ⁸
Resuscitation (BLS,ACLS,ATLS)	PG	Checklist,Time	Girzadas DV, Jr (2007) ²⁰⁰
Resuscitation (BLS,ACLS,ATLS)	MD,RN,EMT	Computer,Counts	Rubens AJ (1991) ²
Resuscitation (BLS,ACLS,ATLS)	PG,MD	Counts,Other	Blum RH (2005) ¹²⁵
Resuscitation (BLS,ACLS,ATLS)	RN	GRS	Berden HJ (1992) ³
Resuscitation (BLS,ACLS,ATLS)	D,A	GRS	Graham CA (2000) ²⁷

Topic (construct)	Trainees	Instrument(s) name or type	Author (year), citation
Resuscitation (BLS,ACLS,ATLS)	MS,PG	GRS	Gordon JA (2003) ⁷⁸
Resuscitation (BLS,ACLS,ATLS)	MS	GRS	Curran VR (2005) ¹²⁷
Resuscitation (BLS,ACLS,ATLS)	PG	GRS	Kim J (2006) ¹⁶⁷
Resuscitation (BLS,ACLS,ATLS)	RN,O,A	GRS	Lockyer J (2006) ¹⁷⁰
Resuscitation (BLS,ACLS,ATLS)	PG,RN	GRS	Malec JF (2007) ²⁰⁹
Resuscitation (BLS,ACLS,ATLS)	RN	GRS	Arnold JJ (2009) ²⁹³
Resuscitation (BLS,ACLS,ATLS)	PG	GRS	Kim J (2009) ³⁰⁸
Resuscitation (BLS,ACLS,ATLS)	EMT	GRS	von Wyl T (2009) ³⁴⁴
Resuscitation (BLS,ACLS,ATLS)	PG	GRS	Donoghue A (2010) ³⁵⁷
Resuscitation (BLS,ACLS,ATLS)	MD,RN	GRS	Weller J (2011) ⁴¹⁵
Resuscitation (BLS,ACLS,ATLS)	MS,PG	Other	Musacchio MJ, Jr (2010) ³⁷⁵
Resuscitation (BLS,ACLS,ATLS)	O	Single item	Perkins GD (2001) ⁴⁴
Resuscitation (BLS,ACLS,ATLS)	MS,PG	Single item,Checklist	Ringsted C (2007) ²²¹
Resuscitation (BLS,ACLS,ATLS)	EMT	Single item,Checklist	Lee KHK (2008) ²⁷³
Resuscitation (BLS,ACLS,ATLS)	MD	Single item,Checklist,GRS	Jansen JJ (1997) ¹¹
Resuscitation (BLS,ACLS,ATLS)	PG	Single item,GRS	Savoldelli GL (2006) ¹⁸²
Resuscitation (BLS,ACLS,ATLS)	MS,PG,MD,RN,A	Single item,GRS	Napier F (2009) ³¹⁴
Resuscitation (BLS,ACLS,ATLS)	MS,RN	Single item,GRS	Cooper S (2010) ³⁵⁵
Robotic surgery	A	Computer	Reiley CE (2009) ³¹⁹
Robotic surgery	MD,A	dV Trainer	Lendvay TS (2008) ²⁷⁴
Robotic surgery	MS,PG,MD	dV Trainer	Kenney PA (2009) ³⁰⁷
Robotic surgery	MS,PG,MD	dV Trainer	Sethi AS (2009) ³²⁶
Robotic surgery	MD,A	Other	Seixas-Mikelus SA (2010) ³⁸⁷
Robotic surgery	MS,PG,MD	ProMIS,Single item	Chandra V (2010) ³⁵³
Robotic surgery	PG,MD,RN,O	RoSS	Seixas-Mikelus SA (2011) ⁴¹⁰
Surgery other	O	MISTELS	Fransson BA (2010) ³⁶¹
Surgery other	MS,PG	PERC Mentor,GRS	Knudsen BE (2006) ¹⁶⁸
Venous access	MS,PG,MD	CathSim	Reznek MA (2002) ⁵³
Venous access	RN	Checklist	Jones T (2002) ⁵⁹
Venous access	MS	Checklist,GRS	Isenberg GA (2011) ⁴⁰²
Venous access	PG,MD	Checklist,Time,Counts	Dong Y (2010) ³⁵⁶
Venous access	MS,PG	Computer	Prystowsky JB (1999) ²⁵
Venous access	MD,RN	Computer,Time	Tzafestas CS (2008) ²⁸⁷
Venous access	PG	Single item,Checklist	Huang GC (2009) ³⁰⁵

Abbreviations:

- Trainee:** MS=medical student; PG=postgraduate physician in training (resident); MD=physician in practice; RN=nurse or nursing student; D=dentist or dental student; EMT=first responder or first responder student; O=other; A=ambiguous.
- Instrument:** GRS=global rating scale. Other abbreviations refer to proprietary instrument names.