ARTICLE REFERENCES	OBJECTIVES	OUTCOME MEASURES	MAIN FINDINGS
Abelson et al., 2015[40]	• Determine feasability of creating a VR operating room • Evaluate simulator for face and construct validity	• Construct validity : metric data • Face validity : Likert-scale questionnaires (realism, inclination to use), Bedford Workload Scale and modified NASA-Task Load Index scale	• Training environment evaluated as realistic • 82% of participants felt low workload or had enough spare capacity for additional tasks. All participants had minimal mental, physical, and temporal demand and none reported requiring a high amount of effort to complete the simulation • No statistically significant difference between attendings and trainees for all responses
Brewin et al., 2015[24]	• Assess validity of distributed simulation environment for NTS training • Evaluate educational impact	• Face, content and construct validity : questionnaires • NOTECHS • Educational impact : questionnaires completed after the simulations	• Good learning environment for NTS, judged realistic • NTS of experienced urologists significantly better than trainees establishing construct validity • All trainees felt more confident • Kirkpatrick level 1 evidence and indirect evidence of learning (Kirkpatrick level 2)
Brunckhorst et al., 2015[25]	• Evaluate feasibility, acceptability, content validity and educational impact of simulation-based curriculum integrating NTS	• NOTSS • Content validity : post-study questionnaire	• 100 % of experts agreed integration of full immersion simulation was a useful tool for teaching non-technical skills • Curriculum-trained group : significantly higher NOTSS scores than control group • Feasibility of delivery of the curriculum was rated 9.27/10, enjoyment and productivity was scored at 9/10, difficulty of curriculum rated 4.93/10
Cohen et al., 2013[41]	• Determine feasability and reliability of skills assessment	• 7-point NTS competency scale for paramedics and T-NOTECHS (Trauma Non-Technical Skills Scale)	• Significant and strong correlations between expert assessors suggest reliability to carry out NTS assessments in virtual environments in major incident scenarios • No significant correlations between expert and self-assessment for NTS
Creutzfeldt et al., 2010[26]	• Evaluate (SA) Situation Awareness self assessment instrument • Analyze SA training in virtual settings	• SA : 9-items questionnaire + trainee's own opinion of his or her SA during training • Concentration/attention : 10-items instrument	• SA increased from the first to the last scenario • Perception of SA corresponded to calculated SA • Correlation between SA and concentration
Dorozhkin et al., 2016[42]	• Establish face validity, usefulness and fidelity of virtual OR fire	• Perceived usefulness and face validity : questionnaire • Open-ended questions : improvements and	• Face validity established with high degree of satisfaction and usefelness • 33/49 participants preferred this modality of training over a traditional one • 47% of subjects offered suggestions on how to make the simulator look and feel more realistic

	training module in VEST simulator	preferences	
Greci et al., 2013[27]	• Develop and evaluate a virtual learning curriculum	• Open-ended questions : technical challenges, course content, immersion • Interviews and focus groups	• All students improved postcourse disaster preparedness knowledge scores • Emerging themes : team communication, team planning, team decision making • Functioning in an unfamiliar environment was evaluated as requiring similar skills as during a disaster where rapid decision making with incomplete information
Grover et al., 2015[28]	• Validate a simulation-based curriculum for cognitive and integrative competencies	• Global performance : Integrated Scenario Global Rating Form (ISGRF) • Communication skills : Communication Global Rating Scale (CGRS)	• Participants significantly outperformed control group with respect to colonoscopy-specific performance, communication skills and global performance during the integrated scenario format assessment 4 to 6 weeks after training
Heinrichs et al., 2010[43]	• Determine efficiency of a Virtual Emergency Department to train mass-casaulty incidents (team skills)	• Immersion, level of comfort, confidence, usefulness for clinical skills and team training : questionnaire • Focus group	• 68% of the participants felt immersed • Everyone felt they learned how to interact in the simulation • "Useful","Very Useful", or "Extremely Useful" for clinical skills training for 82% participants • Participants gained confidence in ability to handle incidents
Hudson et al. , 2015[44]	• Examine perceived usability of Second Life (SL) as an immersive virtual environment • Study clinical decisions	• Perceived usability : System Usability Scale (SUS) • Situation awareness : questionnaire with 27 items	• SL considered usable in providing practice with complex scenarios of insulin administration. Perceived usability decreased among experienced nurses • No significant association between years of nursing experience and SA scores was found.
Khan et al., 2017[29]	• Evaluate effectiveness of a simulation-based training curriculum of NTS on novice endoscopists' performance of clinical colonoscopy.	• Modified Objective Structured Assessment NTS (M-OSANTS) • ISGRF • Integrated Scenario Communication Rating Form (ISCRF) • General Self Efficacy Scale (GSE)	• To inform the potential implementation of NTS into postgraduate gastrointestinal curricula, non-technical performance will be determined by comparing the scores from the M-OSANTS, ISGRF, ISCRF and GSE for both conditions and at 3 different times

Khanal et al., 2014[30]	• Evaluate efficacy of delivering advanced cardiac life support (ACLS) using a virtual reality simulator	• Team performance : electronic checklist based on ACSL guidelines assessed by experts • Final questionnaire on training experience	• No statistically significant difference in improvement of skills between groups • VR-based ACLS training simulator is significantly cheaper, easier to organize, and facilitates users to practice in a team from disparate locations without requiring an evaluator
King et al., 2012[45]	• Evaluate usability of the environment • Evaluate learning effectiveness of scenarios • Evaluate integration into curriculum	• Debriefing: exploration of team interactions • Satisfaction survey and questions on learning in the environment	• Students appreciated to visualize the Emergency Room setting in a low-pressure situation • It provided students with opportunities to communicate with other disciplines, which they would not have had until in clinical practice • Students felt it was great preparation for non-virtual scenarios for clinical situations
Maschuw et al., 2008[31]	• Explore impact of self-belief of surgeons on laparoscopic performance using a VR simulator	• General Self Efficacy (GSE) score Technical metrics : time, economy of motion and damage parameters	• No significant differences were found in gender or in GSE score between both groups • Motions of advanced trainees were more economic than novices, but no significant difference in time, error score and right instrument movements. • Novices GSE scores negatively correlates with economy of motion and time, while for advanced residents it is independent of laparoscopic performance
Paige et al., 2007[46]	• Evaluate perception of simulated scenarios • Evaluate effectiveness for communication and teamwork during OR crisis	• Teamwork assessment: communication, coordination and situational awareness • Questionnaire on perception of training effectiveness and specific attributes of teamwork	• Sessions were found effective/very effective for improving teamwork, communication and recognizing problems in the OR
Riesen et al., 2012[32]	• Improve interprofessional competencies • Determine acceptability of a blended learning environment	• Self-perceived changes in interprofessional attitudes and competence : IEPS, ICCAS • Team performance assessment : TOSCE • Students perceptions : program assessment tool, and 16-item questionnaire	• Significant differences pre and post workshop were found in ICCAS and IEPS scores • Significant improvement accross the 3 simulations in all competencies • Program and learning experience were highly rated • Learner confidence and performance can be improved through education delivered in a virtual environment
Rogers, 2011[49]	• Investigate how a simulation in Second	• Individual interviews: clinical judgement,	• Critical Life simulation is an artificial social structure where problem-based scenarios can be created

	Life can encourage teamwork and collaborative problem solving	teamwork and interpersonal skills	• Students can co-construct mental models expericencing human interaction in problematic environment • Critical Life could develop cognitive understanding of team-orientated procedural and problem-based decision-making skills.
Rudarakanchana et al., 2014[33]	• Evaluate feasability of integration of a VR simulator in an immersive simulation • Investigate construct and face validity for training human factor skills during a crisis scenario	• Questionnaires : realism (face validity) and potential for use in team training for both technical and human factor skills	• Experienced team leaders were significantly faster than trainees • Realism of the environment was scored very high and realism of the VR simulator was rated high • Trainees rated the simulation more useful for technical skills training, and experts believed it more useful in enhancing communication skills • Feasability, face and construct validity of a realistic crisis scenario integrating a VR simulator has been shown
Sankaranarayanan et al., 2016[34]	• Establish face and construct validity of an immersive VR system • Assess the effects of distractions and task interruptions	• 5-point Likert-scale subjective feedback questionnaire : realism, immersive experience, and effects of distractions and interruptions	• Performance decreased with added distractions and interruptions • Subjects rated interruptions very high in their ablity to affect performance and music distraction received the lowest mean rating • Simulators rated as realistic to present distractions and interruptions in a simulated OR, immersion evaluated as intermediate.
Shamim Khan et al., 2013[35]	• Establish feasability and acceptability of simulation training for NTS	• Interviews : perception of simulated environment • Feasability, acceptability and construct validity : questionnaires	• Construct-validity established : Seniors performed significantly better than junior trainees in all simulation sessions • Increased cognitive load for trainees on VR simulator : pressure/anxiety about the unknown and interplay between technical and non-technical skills
Sweigart et al., 2016[36]	• Test utility and acceptability of a virtual learning environment (VLE) • Examine change in teamwork attitudes in interprofessional communication	• Effectiveness : TeamSTEPPS -TAQ (Teamwork Attitude Questionnaire) • Utility : Time to complete scenarios and answers to questions within scenarios • Acceptability : Likert-scale type questions	• Positive student feedback on ease of use and perceived effectiveness for teaching communication and professionalism t • Scores on the T-TAQ revealed significant positive changes in leadership, situation monitoring, mutual support, and communication
Umoren et al., 2017[48]	• Propose an introduction to TeamSTEPPS	• MCQ questions during the progression of the scenarios : designation of a	• Learner recognition of the SBAR communication tool was high accross groups • Knowledge of which component of SBAR was missing was lower accross

	communication tools for nursing and medical students	TeamSTEPPS strategy, identification of a missing component of this strategy and possible selection of another strategy	groups • Students demonstrated increased correct recognition of strategies as they progressed through the scenarios • When they had the choice, students were more likely to chose the Two-Challenge Rule than the CUS
White et al., 2015[47]	• Study quality of information transfer and teamwork during a simulated critical event • Assess gathering and sharing of critical information	• Communication skills: Critical Patient Information checklist and Interprofessional Communication Skills checklist	• A substantial percentage of participants did not share 3 critical items and 87% of the participants missed a dosage error • Items on Communication Checklist were missed by a substantial number of participants (introduction of self and task, closed-loop communication) • No statistically significant relationship between scores and years of nursing •
Willaert et al., 2011[37]	• Evaluate whether a part-task rehearsal of a surgical procedure on a VR simulator is as effective as a full-task one	• Non-technical skills : NOTSS • Face validity and usefulness : questionnaire • Emotional, cognitive and physical stress : short version of State Trait Anxiety Inventory (STAI) questionnaire	• Both groups scored acceptable scores in all categories of NOTSS • Simulated procedure was found highly realistic. Simulation helped participants in decision-making, confidence, reduction of anxiety, and communication. Both strategies were as effective on stress levels • For a moderately difficult case, a part-task patient specific VR rehearsal is as effective as a full-task one
Wucherer et al., 2015[38]	• Measure usability of simulator • Explore relationship between mental workload and surgical performance during crisis	• Cognitive workload : 3-item questionnaire and Surgery Task Load Index (SURG-TLX) • Questionnaire : face validity and training value	• Training resulted in a decrease of time, but significantly slower performances when crises • The more workload was experienced, the poorer was the surgical performance. • Telephone call seemed more disturbing compared to patient discomfort
Youngblood et al., 2008[39]	• Evaluate VLE for leadership and trauma management by comparing users' experience with a high-fidelity patient simulator (PS)	• Leaderdhip skills : EMCRM (Emergency Medicine Crisis Resource Management) scale • Assessment of learning experience : debriefing and questionnaire	• All participants evaluated simulation as “useful” or “very useful” to assess and manage trauma patients in Emergency Department (ED) • All participants showed significant improvement in team leadership • Students emphasized emotional impact of simulation in VLE • Both mannequin-based and VLE simulation of ED cases are valid training methods to improve EMCRM team leadership skills