HOW TO ORGANIZE AND CONDUCT SIMULATION SESSIONS

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Number of simulation centers by region

- North America: 1000
- Europe: 250
- Asia: 200
- Canada: 100
- Australasia: 50
- South America: 25
- Africa: 10
Number of simulation centers in EU
Clinical simulation:

- Provides a safe environment where trainees can learn without the risk of harming a patient
- Provides an environment that is fully attentive to the learner’s needs
- Can be adjusted according to learners need
- Provides an opportunity for repetitive training
- Enables exposure to gradually more complex clinical challenges and rare emergency situations where time is an important factor
- Supports experiential learning
- Provides opportunities for training of the individual and team of health professions
- Gives an opportunity for:
  - Formative assessment, that includes debriefing and feedback
  - Self-reflection
  - Summative assessment
The starting point

- Define the required learning outcomes and learners’ needs

- Define learning objectives (Specific, Measurable, Achievable, Relevant & Realistic, Time-framed)

- Design the simulation session to include activities to help learners achieve the outcomes
Best Practices in Clinical Simulation

- Ensure opportunities for:
  - **Deliberate practice** involving focused repetitive practice and evaluation
  - **Feedback** (both formative and summative)
  - **Curriculum integration** so that simulation is incorporated into the wider curriculum to complement clinical education

- Define **outcome measurements** from educational interventions to establish reliability and validity of those interventions
Best Practices in Clinical Simulation

- Provide opportunities for **mastery learning** (deliberate practice with clearly defined learning objectives and set of minimal standards required before progression to further stages)

- Establish use for **high-stakes testing** procedures

- Ensure simulation training is used in the correct educational and professional context
Miller’s Pyramid with examples of assessment modalities for each level

- **Workplace-based assessment**
- **Objective structured clinical examination**
- **Case-based discussion**
- **Multiple-choice questions**

- WPBA
- OSCE
- CBD
- MCQ

Levels:
- **Does**
- **Shows how**
- **Knows how**
- **Knows**

- **SPM**
- **WCE**
- **MED SKILLS OSCE**

- Performance
- Competence
- Knowledge
Classification of Simulators

Anesoft Sedation Simulator 4 - Oral Surgery Case 8 - 6 year old boy for pulp therapy for tooth T

**Drug Administration**

- **Drug:** Midazolam
- **Dose:** 1.0 mg IV

**Time:** 00:02:42

**Score:** 100 / 1200

**Midazolam**

**Pharmacologic Action**

Midazolam is a benzodiazepine. It has sedative and amnestic properties.

Midazolam is much more water soluble than diazepam or lorazepam and has a faster onset time. Midazolam can be administered by intravenous, intramuscular, oral, sublingual, nasal and rectal routes although better taste makes the sublingual route difficult.

Midazolam is extensively biotransformed by hepatic enzymes and is then conjugated and excreted in the urine. Clearance of midazolam is approximately 15 times that of diazepam. Typical elimination half-life is 2–4 hours. Aging does not appear to change the pharmokinetics of midazolam.
# Classification of Simulators

<table>
<thead>
<tr>
<th></th>
<th>Appearance</th>
<th>Interaction with the learner</th>
<th>Educational context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part task trainer</td>
<td>Realistic, but of a single body part</td>
<td>Feels realistic but limited or no response</td>
<td>Repetitive practice of isolated skill</td>
</tr>
<tr>
<td>Full body simulator</td>
<td>Realistic body, often with associated physiological modelling</td>
<td>Allows examination (for example, pulses) and realistic interactions</td>
<td>Realistic practice of whole scenarios</td>
</tr>
<tr>
<td>Screen simulator</td>
<td>2D image of patient, equipment or staff</td>
<td>Realistic response to input via keyboard or mouse</td>
<td>Cognitive exploration of a variety of situations</td>
</tr>
<tr>
<td>Virtual reality</td>
<td>3D image of patient, equipment or staff</td>
<td>Realistic response to input via a variety of methods</td>
<td>Realistic practice, often of a defined task</td>
</tr>
<tr>
<td>Real people as simulators</td>
<td>Real people</td>
<td>Verbal and non-verbal communication</td>
<td>Practice of a variety of clinical skills</td>
</tr>
<tr>
<td>Hybrid simulation</td>
<td>Any combination of the above</td>
<td>Verbal and non-verbal communication and interaction</td>
<td>Realistic practice</td>
</tr>
<tr>
<td>Simulated environments</td>
<td>An entire clinical environment</td>
<td>Full interaction with patient and team</td>
<td>Realistic practice and team training</td>
</tr>
</tbody>
</table>
Partial task trainer

- Realistic, single body part
- Realistic, but limited or no response
- Allows repetitive practice of isolated skill
Realistic body with physiologic modeling
- Allows examination, realistic interactions, and practice of realistic scenarios
Screen simulator

- 2D images of a patient, equipment and staff
- Realistic response to input via keyboard or mouse
- Cognitive exploration of variety of situations
Virtual reality

- 3D images of a patient, equipment and staff
- Realistic response to input via variety of methods
- Realistic practice of a defined task
Real people as simulators
Standardized and simulated patients

- Training of verbal and non-verbal communication
- Practice of variety of clinical skills
Hybrid simulation

- **SP(s) + simulator**: training of verbal and non-verbal communication and interaction
- Realistic practice
Hybrid simulation - the process of attaching part-task trainers to standardized/simulated patients, assessment of clinical skills can include added complexity to measure aspects of the doctor–patient interaction.
Simulated environments

- Simulation of the clinical and/or OR environment
- Enables full interaction with patient and team, allowing realistic practice and team training
Simulation *in situ*

- Simulation is no longer confined to the simulation center due to the advent of the *wireless manikin*.
- *In situ simulation* provides the opportunity to identify latent threats which exist in the clinical environment by replicating challenging scenarios in the workplace.
Assessment Steps

- Choose the **appropriate level of fidelity**

- The blind use of the highest fidelity available is a principle which should be avoided

- Define the aims and significance of the assessment, typically to appraise the competence
Define the domain of the assessment

- Technical skills
- Non-technical skills
- Medical knowledge
- Clinical reasoning
- Patient management skills
- Personal attributes
- Teamwork
- Confidence
Scoring Metrics

- **Use of established instruments** (checklist scores and rating scales)
- **Internal metrics** (digital timers, motions and pressure sensors, instrument trackers)

- Creation of **checklist scores**
- Creation of **global rating scales**
Learner’s final score is commonly just a simple count of the number of actions that were performed or a sum of the item scores if ordered completion categories are employed.

Where some actions are deemed more important than others the item scores can be weighted, although again determination of appropriate weights is a matter of subjective judgement.
Checklist Scores

- List of observable actions and outcomes, appropriate to the presented scenario, which are important for the learner to complete in order to exhibit their proficiency in certain skill/clinical situation

- Usually scored on Yes/No basis (binary)
- Done/Not done

- Expert consensus should be used to determine which actions to include in a checklist
**PELVIC EXAM AND PAP SMEAR**

**STUDENT:** __________________________________________________________

**DATE:** __________________________

<table>
<thead>
<tr>
<th>General Technique / Exam Skills</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examines the external genitalia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gloves remain clean during the course of examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holds speculum at 45 degree angle; inserts and opens speculum appropriately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspects the cervix and vagina walls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collects the ectocervical cells for liquid based cytology (360 degrees)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collects the endocervical cells for liquid based cytology (180 degrees)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uses correct technique to collect cells into the vial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labels the specimen appropriately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collects the cervical cells correctly using spatula and cytobrush</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removes the speculum correctly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL**
Comprises an ordered list of levels of performance to which numerical scores are attributed:

- 1 = very poor
- 2 = poor
- 3 = satisfactory
- 4 = good
- 5 = very good

May be specific by anchoring to observed behaviors

Complex
## GLOBAL RATING SCALE OF OPERATIVE PERFORMANCE

Please circle the number corresponding to the candidate’s performance in each category, irrespective of training level.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respect for Tissue:</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Frequently used unnecessary force on tissue or caused damage by inappropriate use of instruments</td>
</tr>
<tr>
<td>2</td>
<td>Careful handling of tissue but occasionally caused inadvertent damage</td>
</tr>
<tr>
<td>3</td>
<td>Consistently handled tissue appropriately with minimal damage</td>
</tr>
<tr>
<td><strong>Time and Motion:</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Many unnecessary moves</td>
</tr>
<tr>
<td>2</td>
<td>Efficient time/motion but some unnecessary moves</td>
</tr>
<tr>
<td>3</td>
<td>Clear economy of movement and maximum efficiency</td>
</tr>
<tr>
<td><strong>Instrument Handling:</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Repeatedly makes tentative or awkward moves with instruments by inappropriate use of instruments</td>
</tr>
<tr>
<td>2</td>
<td>Competent use of instruments but occasionally appeared stiff or awkward</td>
</tr>
<tr>
<td>3</td>
<td>Fluid moves with instruments and no awkwardness</td>
</tr>
<tr>
<td><strong>Knowledge of Instruments:</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Frequently asked for wrong instrument or used inappropriate instrument</td>
</tr>
<tr>
<td>2</td>
<td>Knew names of most instruments and used appropriate instrument</td>
</tr>
<tr>
<td>3</td>
<td>Obviously familiar with the instruments and their names</td>
</tr>
<tr>
<td><strong>Flow of Operation:</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Frequently stopped operating and seemed unsure of next move</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrated some forward planning with reasonable progression of procedure</td>
</tr>
<tr>
<td>3</td>
<td>Obviously planned course of operation with effortless flow from one move to the next</td>
</tr>
<tr>
<td><strong>Use of Assistants:</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Consistently placed assistants poorly or failed to use assistants</td>
</tr>
<tr>
<td>2</td>
<td>Appropriate use of assistants most of the time</td>
</tr>
<tr>
<td>3</td>
<td>Strategically used assistants to the best advantage at all time</td>
</tr>
<tr>
<td><strong>Knowledge of Specific Procedure:</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Deficient knowledge. Needed specific instruction at most steps</td>
</tr>
<tr>
<td>2</td>
<td>Knew all important steps of operation</td>
</tr>
<tr>
<td>3</td>
<td>Demonstrated familiarity with all aspects of operation</td>
</tr>
</tbody>
</table>
## Checklists vs. global rating scales

<table>
<thead>
<tr>
<th>Checklists</th>
<th>Global rating scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not differentiate between different levels of performance</td>
<td>Differentiate between different levels of performance</td>
</tr>
<tr>
<td>Do not take into account the sequence and timing of actions performed</td>
<td>May take into account the sequence and timing of actions performed</td>
</tr>
<tr>
<td>Objective</td>
<td>Subjective</td>
</tr>
<tr>
<td>Assessment of performance skills</td>
<td>Generic aspects of performance</td>
</tr>
</tbody>
</table>
Assessors

- Experienced; with clinical expertise
- Non-expert raters (standardized patients, residents, medical students...)
- Peer rating
- Self-assessment
Quality Assurance: Piloting the assessment

- Timing and realism of the scenario
- The difficulty level of the tasks
- The adequacy of the participant instructions
- The appropriateness and feasibility of the scoring system
- Assessment of the instruments
- Identifying unanticipated problems
Challenges of the assessment method

- Checklist item construction
- Rater training
- Rater (assessor) experience
- Rater calibration
Quality Assurance

Six attributes of good assessment:

- Reliable
- Valid
- With educational impact
- Cost-efficient
- Acceptable
- Feasible
A reliable assessment must produce measurements of individual performance that are **reproducible in similar circumstances such as on other occasions** (test-retest reliability) or using other raters (inter-rater reliability)
Gather two or more raters to score the performance and establish the degree of inter-rater reliability.
Variation in scores awarded by a single rater at two viewings of the same performance (intra-rater reliability)

Variation between multiple raters scoring the same performance (inter-rater reliability)
**Validity**

- **Validation** is a process of gathering evidence, from multiple sources, to show that such interpretations are sound and sensible.
  
  - Face validation
  - Content validation
Face and Content Validity

- **Face validity:** the assessment appears to be realistically measuring the desired attributes (e.g. ability to perform a Pap smear)

- **Content validity:** the assessment effectively assesses the relevant or important domains at a level appropriate to the intended examinees
Face and Content Validity

- Both are established on the basis of subjective judgements of the assessment tool made by stakeholders in the process
- Should be assessed before implementation of the assessment
Correlate the results of an assessment with those of a second assessment (on the same group of individuals) that captures some of the same dimensions of performance.

Should be conducted close in time to the first assessment.
Educational Impact

- Formative feedback
- Summative feedback

- Informs learners about their current levels of performance
- Highlights their individual strengths and weaknesses, and
- Points the way towards future learning and development
Acceptability, Feasibility and Cost-Effectiveness

- **Acceptability**: Create surveys that gather stakeholder perceptions of whether the assessment is fair, is set at an appropriate level of difficulty and afford adequate opportunity for learners to display their abilities.

- **Feasibility and cost-effectiveness**: time and resource intensive.
Standard Setting for Summative Assessments

- **Fixed percentage method** is a relative method whereby the proportion of examinees who will pass is predetermined for each cohort.

- **Hofstee method**: Experts set minimum and maximum pass scores and minimum and maximum acceptable failure rates. A graphical method is then used to identify a cut-point that falls between these extremes.

- **Contrasting groups method** judges are asked to examine the overall performance of a sample of candidates and award each one a pass or fail, regardless of the actual scores awarded.
Faculty Roles in Simulation

- Lead simulation educator
- Instructor
- Coach
- Mentor
- Facilitator
- Assessor
- Quality improvement lead
- Clinical service lead
How to prepare for simulation

- Acquire the technical skill
- Make the context real
- Identify non-technical skills associated with practical procedures (situation awareness, team working, etc.)
- Create scenario learning objectives
- Design scenario to develop technical and non-technical skills
- Ensure safe learning environment
- Debrief / Assess
Competencies of the simulation based educator

- Orientation and familiarization with different simulation modalities
- Developing and sustaining a safe learning environment
- Designing effective simulation-based learning
- Facilitation skills
- Effective feedback and debriefing skills
- Know how to use video-enhanced debriefing
Create a skeleton outline of simulation session 1

- Timetable encompassing the availability of suitable facilities, equipment, paperwork, assessors, standardized patients, participants, technical and administrative support personnel

- Compile contact details/eRaiders for all participants

- Consider contingency plans for the ‘failure’ of any of the components: what to do if an assessor fails to turn up on the simulation day
Create a skeleton outline of simulation session II

- Prepare and print paperwork, including score sheets, information and guidance for all those involved

- Give clear directions for where to go, when to arrive, what to expect, how long the assessment will take and when the results will be available
One or two business days before session

- Double check that facilities are functioning, paperwork is organized and equipment is available

- If possible set up and test all equipment before the day of the assessment
On the Day

- Conduct short verbal briefings for assessors, technicians and administrative assistants
- Conduct briefing for learners so they know what to expect and how they will be evaluated
- Communicate any last minute information that may not be included in the advance information
- Learning activity: Take time to debrief after the session
Transfer checklist scores and ratings from paper sheets to a computer database, by hand or electronic scanning if possible, as promptly as possible after the assessment in order to facilitate timely feedback to the learners.

Deliver results and feedback to the learners regarding their performance in the assessment.

Organize debriefing and define areas for improvement.
Establish a team motivated to use simulation
Determine location
Identify and gather equipment
Determine current standards of best practice
Create learning objectives
Develop scenarios to meet pre-identified learning objectives
Plan simulation sessions into the timetable / Create score sheets and guidelines
Run pilot scenarios
Ensure written consent from participants if recording will be used
Run simulation session and debriefing
Ask participants to provide feedback
Run survey (with learners and trainers, assesses and assessors)
Keep a record of all simulation sessions for audit / quality assurance
Review feedback and surveys
Make the appropriate changes to the learning objectives, equipment & session structure
Review to ensure sessions remain contemporary