ESTABLISHING
a Simulation Center:

Essentials and Guidelines
Experience of the Mother and Child Health Project

Swiss TPH
Swiss Tropical and Public Health Institute
Schweizerisches Tropen- und Public Health-Institut
Institut Tropical et de Santé Publique Suisse

ПРОГРАМА «ЗДОРОВ'Я МАТЕРІ ТА ДИТИНИ»
ШВЕЙЦАРІЯ–УКРАЇНА

MOTHER AND CHILD HEALTH PROGRAMME
UKRAINE–SWITZERLAND

Funded by the Swiss Confederation
Schweizerische Eidgenossenschaft
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The Handbook summarizes the concepts and the experience in the simulation-based medical education to guide the professional communities in the countries where this approach has not been developed yet. The focus is on maternal and child health, but the underlying concepts are similar to other topic areas.

The first part of the handbook describes the concepts related to the establishment of simulation centers, the role of simulation-based training in medical education, and reviews national and international experiences. The second part provides the methodology and tools to develop and implement simulation centers, including topics such as organisational capacity building, technology requirements, curriculum development and economic considerations.

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Abbreviations

CESIMED	Centro de Simulação Médica do Porto
CME	Continuous Medical Education
CPR	Cardiopulmonary resuscitation
CRM	Crew Resource Management
CSL	Clinical Skills Laboratory
ECG	Electrocardiogram
ICT	Information Communication Technology
INEM	Portuguese National Institute of Medical Emergency
IT	Information Technology
MCI	Mother and Child Institute (Moldova, Chisinau)
MCH	Maternal and Child Health
MCHP	Mother and Child Health Programme
MEP	Medical Education Project
MoH	Ministry of Health
MPSP	Modernising Perinatology System Project
OSCE	Objective Structured Clinical Examination
SBME	Simulation-based Medical Education
SMPU	State Medical and Pharmaceutical University
TSMU	Tajik State Medical University

Introduction

The longstanding Ukrainian-Swiss partnership aimed at supporting the modernisation of health services in the area of Maternal and Child Health and health systems strengthening dates back to 1997. Various succeeding projects have been planned and implemented with the Ministry of Health and local partners in the regions of Rivne, Donetsk, Volyn, Ivano-Frankivsk, Crimea and Vinnytsia. The Programme is oriented towards two main targets:

- to improve the quality and efficiency of perinatal services;
- to support MCH reform efforts with policy development and capacity building.

Within the frame of this project, Maternal and Child Health (MCH) clinical Simulation Centers have been established in four regional perinatal hospitals: Crimea, Ivano-Frankivsk, Vinnytsia, and Volyn. Since mid-2014 these Centers provide weekly training courses for medical professionals.

The interest in developing a handbook for MCH Simulation Centers came from the growing evidence that Simulation-Based Medical Education (SBME) has a substantial positive impact on the daily practice routine of health professionals in Ukraine. First solid steps have been made to anchor the concept of SMBE in Ukraine. Four regions managed to set up, develop and operate Simulation Centers. There is yet a long way to go until all regions follow suit and integrate this innovative training methodology and technique into their system of medical education and thus enhance practical skills to improve healthcare services. The objective of this handbook is, therefore, to guide professional communities within Ukraine and in other countries where SBME has not been developed yet. The focus is currently on MCH but the underlying concepts of SBME are similar to other topic areas.

The handbook is divided in two main parts: the first part describes the concepts related to the establishment of Simulation Centers, the role of simulation-based training in medical education, and reviews national and international experiences of establishing of these types of institutions. The second part provides the methodology and tools to develop and implement MCH Simulation Centers, including topics such as organisational capacity building, technology requirements, curriculum development and economic considerations. A variety of experts with experience in implementing SBME have contributed to this handbook. Their areas of expertise include:

- Health Project Management
- Medical Education and Medical Simulation
- Health Technology Planning
- Medical specialization such as Obstetrics, Anaesthesiology, Gynaecology, Neonatology, Paediatrics, Intensive Care

Simulation Centers

1.1 Concept Definition

This section provides definition of several concepts related to simulation and didactic approaches used in simulation and referred throughout the Handbook.

Simulation and Simulation-based Medical Education

Simulation is the imitation of the operation of a real-world process or system over time[4]. Simulation is used in many contexts, such as simulation of technology for performance optimization, safety engineering, testing, training, education, and video games. The use of simulation as a technique for practice and learning is designated as simulation-based education.

Medical skills are acquired through cognitive (knowledge) and psychomotor skills (practice). The non-technical skills like communication, clinical judgment and planning are already included in the basic clinical-theoretical training within medical education. To learn and improve technical / psychomotor skills and interpersonal skills, repeated practice and simulation is needed, allowing the automation of manual skills and dexterity. The use of simulation tools and techniques in medical education is called Simulation-based Medical Education (SBME).

Clinical Skills Laboratories / Simulation Centers

A clinical skills laboratory (CSL) is a training facility for medical students (undergraduate) or health professionals (postgraduate) which enables to acquire / train skills and procedures in a safe and protected environment. These facilities are also widely referred to as Simulation Centers.

A Simulation Center can be used for undergraduate training (e.g., in the study of anatomy, physiological functions, familiarization with medical examination techniques), for residency training (e.g., in refining and mastering procedural skills and techniques or preparing for practical examinations, refresher courses, and recertification tests etc.), for continuing medical or nursing education (e.g., training in practical skills, team-based competencies), or for competency testing prior to recruitment[27].

Didactic Approaches

ΠSeveral didactic approaches can be incorporated during trainings in clinical skill laboratories. Some of the approaches used in simulation-based medical education are:

- OSCE's (Objective Structured Clinical Examination): OSCE is a type of examination designed to test performance and competence in skills such as communication, clinical examination, medical procedures / prescription, exercise prescription, etc. It includes a circuit of stations on a time control approach with either real or simulated patients (patient-actors). Each station has a different examiner and trainees rotate through all the stations.

Figure 1 – Hybrid scenario with Standardized Patient

- Briefing and Debriefing: Briefing is a presentation of a scenario to be performed as well as related protocols and guidelines. It contextualizes the trainees and offers an overview of what will happen in the scenario training. Debriefing is a kind of feedback process that promotes critical reflection and constructive discussions about the practical experience, trainee's performance, behaviours and decision making.
- Scenarios: Scenarios simulate clinical events as close to real-life situations as possible in a safe environment, with the possibility to update and adapt to the needs of each training session and trainees, aiming to train technical and non-technical skills. The use of scenarios allows the trainees to put themselves in specific situations, consolidating the knowledge, skills and decision-making activities under stress, preparing them for similar situations in the future.

More detailed information on these methodologies is given in chapter 2.1 Development and action plan, under the Curriculum Development section.

Simulation Tools

Simulation-based medical education (SBME) involves the use of several tools. These tools can be divided in three main categories:

- Standardized Patient: person trained to portray a patient with a clinical history and with certain health conditions; used primarily for practicing collection of clinical history and communication with patients; also used for conducting practical exams, this type of examination practice is called OSCE's (Objective Structured Clinical Examination).
- Models: static simulation tools designed for mastering specific procedures and techniques; usually represent specific body parts (e.g. arm, head, pelvis, etc.)
- Simulators: similar to the above but with additional feature of providing feedback to the user; usually linked to computers, with interfaces that allow the configuration and simulation of scenarios and different types of patient feedback, e.g. vital indicators like heart rate, blood pressure, oxygen saturation, and clinical signs, e.g. chest expansion, cardiorespiratory auscultation.

Figure 2
Obstetric & Neonatal Simulators

1.2 Educational Grounding for the Establishment of Simulation Centers

How SBME can help achieve Health system's goals and address its challenges

The main goal of health system is to provide healthcare according to reference standards through an organized structure and intending to improve health at the lowest (optimal) cost. To pursue this objective a well-designed organization is required, ideally stratified by levels of specialization and divided into administrative regions, depending on size, demographics and available resources.

In a health system, comprising local units (primary care centers, hospitals) with varying degrees of expertise, unequivocal referencing criteria supported by an efficient communication network are crucial. Sufficient human resources, holding clinical competences obtained through certified graduation programs and reassured by continuing postgraduate medical education are essential as well.

Governance bodies working together with local health administrations, faculties and leading health professional organizations (professional societies, institutions for undergraduate and postgraduate medical education), as well as local opinion leaders

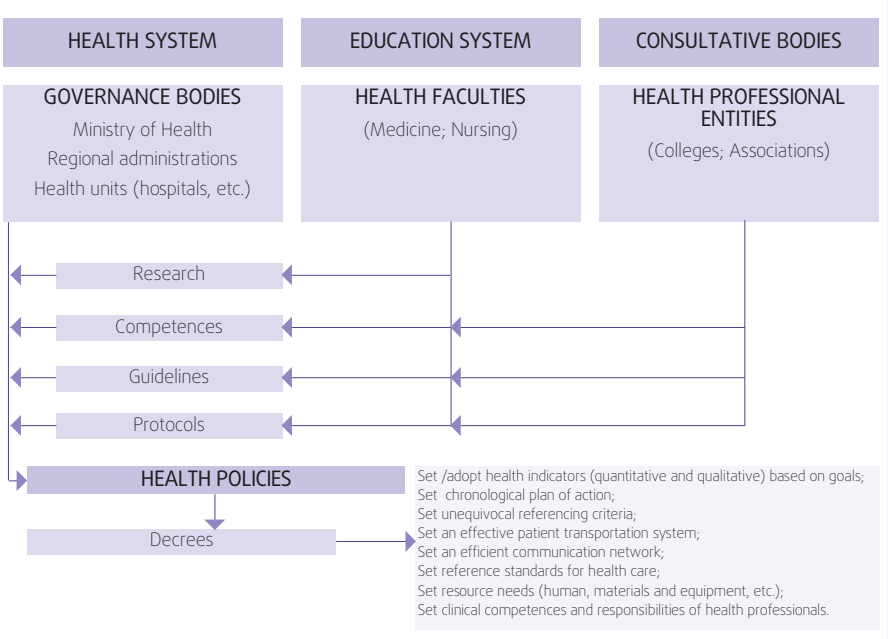

Figure 3 - **Framework of parties to determine health policies**

must define conjoint educational and health policies based on healthcare needs (e.g. human resources) and achievements (e.g. improvement of health indicators), as well as patient safety and satisfaction with the quality of healthcare and favorable outcomes. The functioning of the whole system (health organization), competences obtained at each educational level and responsibilities of health professionals, individual or as part of a team, should be clearly defined. Figure 3 represents complementarity of health and education systems and existing consultative bodies in determining health policies. Educational goals, programme design and organization of SBME must contribute to all of these needs and outputs.

Currently education in healthcare faces a number of challenges, including the increasing number of students, change in their preferred learning styles and a need to reduce the gaps between theory and clinical practice. Furthermore, a growing concern with patient safety, ethical issues, increase in medical liability, the high level of expertise that is required and fast evolution of procedures and techniques created an urge for curricula adaptation that should consider existing educational tools.

At the same time, traditional forms of medical education do not provide an exceptional process for ensuring completely safe and efficient training prior to practitioners' active engagement with patients. Moreover, current forms of monitoring the competence level of medical practitioners are largely inconsistent or lacking. From under/post-graduation to continued education, SBME has been helping to overcome these challenges. This is a summary of how SBME can help to accomplish these goals:

- Decrease in training opportunities;
- Rising number of students;
- Reduction of working hours of junior doctors;
- Patient safety issues;
- Ethical problems resulting from the acquisition and development of skills using real patients;
- Need for standardization of training experiences;
- Need for competence assessment and certification;
- Need for fast integration of staff (staff turnover);
- Recommendation of high standards of care;
- Increase in medical liability;
- Ability to rehearse common and uncommon clinical situations with serious consequences;
- Possibility to promote acquisition/ development/reinforcement/transference of knowledge;
- Possibility to promote acquisition/ development/reinforcement/transference of skills:
- Ability to train technical skills;
- Ability to train individual, multi-professional and multi-disciplinary care (non-technical skills/teamwork);
- Ability to test organizational factors (emergency drill in the workplace).

Structured simulation-based training programmes have proven extremely useful in procedural high hazard medical areas such as Obstetrics, Anaesthesiology, Emergent and Critical Care, Surgery or Paediatrics for training staff, working with and perfecting current clinical protocols and practical algorithms and/or testing organizational factors in the management of emergencies. Furthermore, based on confidential enquiries of poor clinical

outcomes or health claims analysis, leading health organizations have recommended standards of care that are also forcing the implementation of simulation-based training.

Defining educational objectives of Simulation Centers

As didactic intervention, medical simulation must be developed based on educational needs and goals in healthcare. SBME objectives should be outlined according to competences of clinical practice to be acquired or improved at each educational level.

Competences for clinical practice include capabilities referred to as "knowledge" (conceptual, cognitive), "technical skills" (psychomotor), and "attitudes" or "non-technical skills" (individual or teamwork skills). These skills relate to an individual or to functioning of a working team. A working team may incorporate elements from different professions (multi-professional) and/or more than one medical area (multidisciplinary).

Teamwork skills are based on Crew Resource Management principles from the aviation industry and include: ability to communicate with other team members, institutions, patients and their families; sharing of clear goals; preparing and planning together; developing a climate of support and trust; conflict management; role clarity (leadership and subordination); managing equipment and human resources; appropriate workload distribution.

Depending on the planned educational objectives (knowledge, technical and non-technical skills), SBME impact can be assessed through written tests and/or videotaped simulations using checklists and rating scales to evaluate performance. Other forms of SBME assessment include evaluation of the impact on clinical outcomes and/or organization of health units. In a broader perspective (regional or national) SBME can be evaluated by analysing impact on health indicators or organization of health system. A schematic representation of the methodology to produce educational goals of Simulation Centers and evaluate SBME impact is shown in Figure 4.

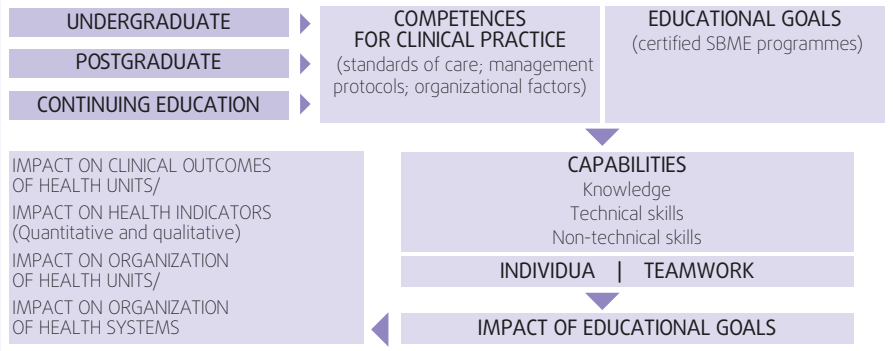

Figure 4 - **Methodology to produce educational goals of Simulation Centers and SBME impact evaluation**

How SBME can be introduced in different settings

SBME programmes must be developed to collaborate in the acquisition of clinical competences at each education level or maintenance/improvement of skills throughout continuing education (e.g. introduction of new technologies into clinical practice, extensive application of management protocols, teamwork training in critical situations, etc.). Figure 5 represents a flowchart summarizing the building of a structured SBME training programme.

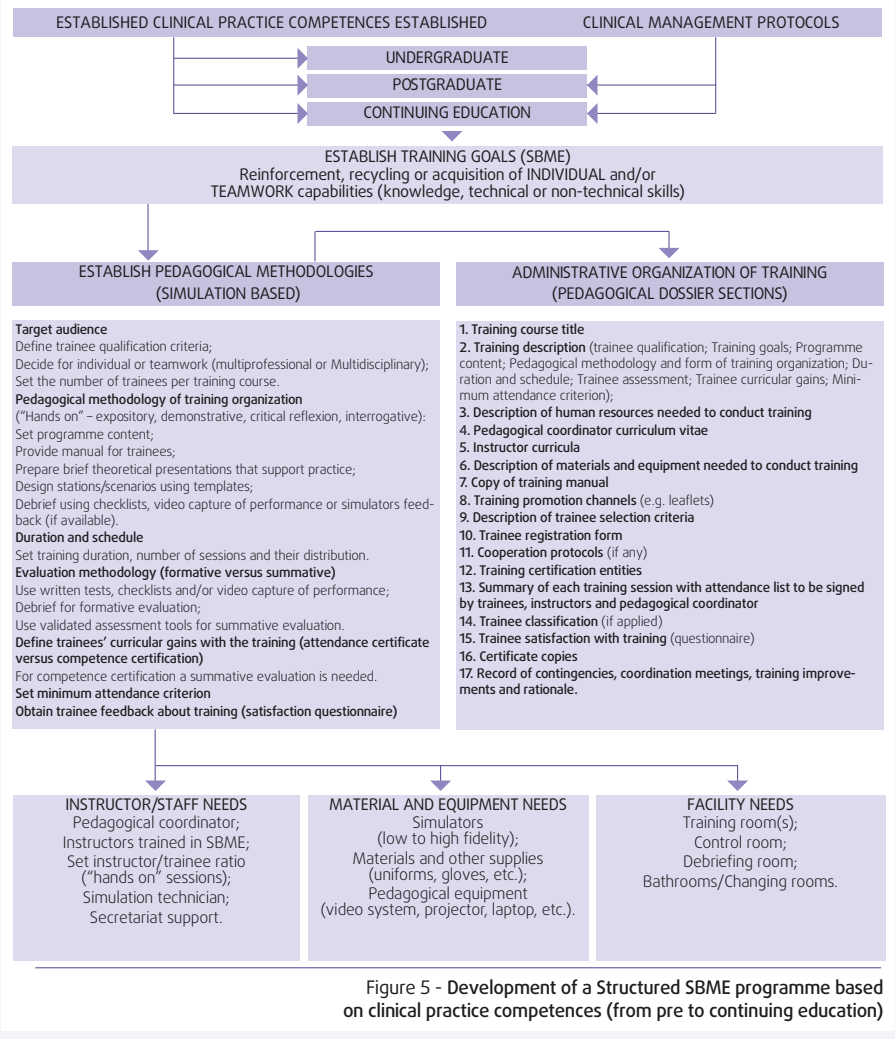

Figure 5 - **Development of a Structured SBME programme based on clinical practice competences (from pre to continuing education)**

1.3 International Experiences and Trends

Republic of Moldova

Simulation–Based Medical Education in the Republic of Moldova

Simulation is being used to support medical education in Moldova since 2013. It is implemented in undergraduate education and in postgraduate programs for health professionals at SimLab of the Mother and Child Institute (MCI) and the Simulation Center of the State Medical and Pharmaceutical University (SMPU). Simulation courses at the MCI are run in cooperation with the Association of Perinatal Medicine. SBME at the MCI is focused on improving inter-professional cooperation and strengthening of professional teamwork in maternity hospitals with special emphasis on strengthening of emergency care. This cutting-edge approach to practical training contributed to the increased level of professionalism of health providers, according to the feedback provided by trainees. SBME is mainly implemented in Maternal and Child Health Care and is included in post-graduate education curricula for health professionals.

Simulation Laboratory on Obstetrical and Neonatal Emergency

SimLab was set up in the framework of the Moldova-Swiss Modernising Perinatology System Project (MPSP), Phase III (2011-14). Before simulation-based education was implemented, medical education was largely theoretical and classroom based. Built on a well-defined methodology and using mannequins the SimLab focuses on developing practical skills of medical personnel, building responsibility of each member of medical team, coordinating actions, as well as stimulating collaboration between the team of specialists. SimLab at the MCI includes two areas: i) the simulation room with mannequins of mother and newborn and ii) the debriefing room where discussions take place after completion of the sce-

Figure 6 - Obstetrical emergency care training

nario. Nine clinical scenarios are used in Newborn Resuscitation and Obstetrical Emergency Care trainings. The skilled team of national trainers includes obstetricians, neonatologists, anaesthesiologists and midwives from MCI and SMPU. 564 professionals from Perinatal Centers of level II and III have completed the abovementioned trainings. SimLab's main challenges were related to the development of scenarios for multidisciplinary teams through incorporation of sections from different disciplines, lack of work experience in the field and lack of a standard teaching methodology, as well as initially sceptical attitude of the participants towards the course, perception of mannequin as a real patient and insufficient involvement of decision-makers in the course. The benefits of simulation courses are: strengthening of participants' practical skills, discussion of each action with team and trainers, self-evaluation, temporary manifestation as leader or subordinate, opportunity to participate in rare clinical cases. Next, SimLab plans to train multidisciplinary teams from Level I maternity hospitals through mobile simulation courses, to develop and implement new scenarios, to train new trainers and to move towards accreditation of existing training courses and modules.

Future Steps in the Republic of Moldova

In future SBME will be integrated deeply in graduate and in post-graduate education for health professionals. Attempts will be made to develop modules and scenarios for paramedics. National and regional collaboration will be strengthened to make SBME more sustainable after completion of MPSP.

Portugal

Simulation–Based Medical Education in Portugal

It's quite difficult to establish an exact date of the first use of SBME in Portugal. Modern simulators have been in use since the 1980's as auxiliary teaching tools in some medical disciplines (e.g. anaesthesiology or cardiology), accompanying educational needs and evolution of available simulators. Likewise, from its early beginning, in 1981, the National Institute of Medical Emergency (INEM), the first line of care for medical emergencies outside the hospital, used simulation-based education to train staff in emergency medicine skills.

However, SBME technological developments, its potential and recent challenges of medical education in Portugal have led to the emergence of Simulation Centers relying on medical schools, from the early 21st century (2002-2003). A Simulation Center is a special training facility with own human resources, including a director or coordinator.

The growing number of medical students, changing learning styles together with patient safety issues and increase in medical liability urged for curricular developments and adjustments in teaching methodologies. In 2006-2007 all medical schools in Portugal used simulators (anatomical models) or techniques of medical simulation (didactic computer software) in their undergraduate training. Main areas for SBME application were Anaesthesiology/Critical Care, Surgery, Obstetrics,

Neonatology, Paediatrics, Internal Medicine and Psychology (communication skills). In addition to medical course, medical schools have also run some short-term simulation-based training programmes, from undergraduate to continued medical education, in the areas of Anaesthesiology / Intensive Care, Surgery, Obstetrics and Neonatology, in collaboration with hospital departments, regional health administrations or professional associations (colleges) to develop or strengthen skills.

In 2010, Portuguese College of Obstetrics and Gynaecology adopted two simulation-based training programmes in Obstetrics as part of residency training, the "Basic Interventions in Labour and Delivery" and "Obstetric Emergencies". The introduction of a structured simulation-based training programme in gynaecological endoscopy will surely be implemented in the near future. Between 2011 and 2013, multidisciplinary training in obstetric emergencies aimed at health professionals working in the National health system was given priority by the Ministry of Health for the allocation of financial support in state owned hospitals. Recently, in 2014, as the result of the Military Health System reform, a medical Simulation Center shared between Navy, Army and Air Force was created. It is part of the unit responsible for postgraduate training in military healthcare in relation to hospital care, operational medicine and emergency training.

SBME in Portugal has been used to complement training needs, as there is no specific national strategy related to this type of educational intervention. Portuguese education and health systems are clearly structured. Governance bodies, jointly with health professional organizations, define competences to acquire at each graduation level or advanced training, and promote good practices in healthcare. Additionally, organizations that certify educational entities have strict guidelines concerning training organization, quality control and programme content.

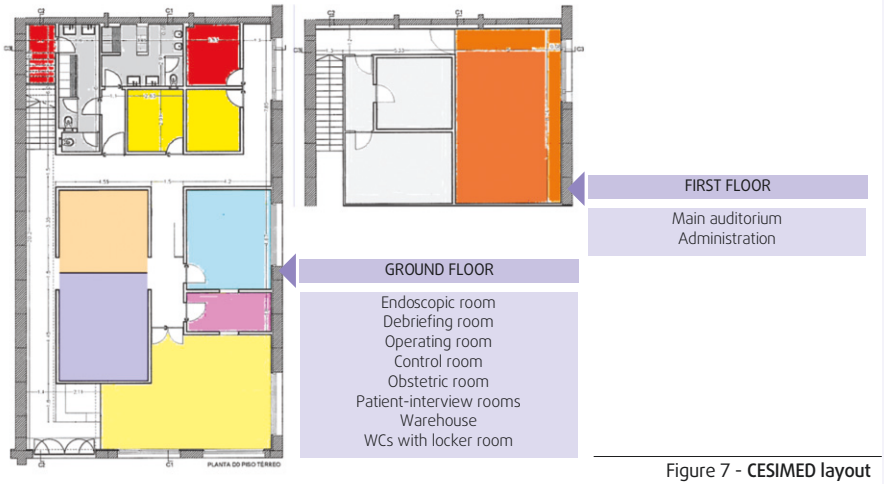

Figure 7 - **CESIMED layout (Lionesa Building)**

CESIMED – Centro de Simulação Médica do Porto

CESIMED - "Centro de Simulação Médica do Porto" is a private self-funding medical simulation Center established in 2008, is located in Matosinhos, Portugal. It is a healthcare training entity accredited by the national General Directorate for Employment and Labour Relations. Its main objective is to provide simulation-based training in healthcare using the best evidence-based practices. Cooperation protocol with the Faculty of Medicine of the University of Porto enables CESIMED to contract out teaching staff from that institution. Cooperation protocol with another higher education institution was signed to include simulation-based teaching in a post-graduate programme (midwifery).

Between 2008 and 2013 office and training facilities were located in the same building (Lionesa area). Since 2013, trainings are being conducted in the education department of the hospital affiliated with the Faculty of Medicine, Porto University, with residency training (Local Health Unit of Matosinhos, EPE).

Main target areas of education have been Obstetrics, Gynaecology and Life Support, at post-graduate level and continued education of health personnel. Multi-professional, multidisciplinary and individual training of skills have been conducted in short-term (5 to 20 hours) simulation-based courses. Instructor-driven simulators, simulators with performance feedback, patient actors and training boxes have all been used. Video-captured images of trainees' performance and/or acting checklists, based on adopted management protocols, are used for debriefing (formative evaluation).

In 2009 CESIMED prepared and proposed a multidisciplinary training programme in obstetric emergencies for obstetric staff working in public hospitals. It collaborated with schools of nursing in training promoted by the Northern Regional Health Administration, the Portuguese College of Obstetrics and Gynaecology and Education Departments of various hospitals. Internationalization started in 2013 through collaboration with the Swiss Tropical and Public Health Institute in the implementation of simulation-based training in Obstetrics and Paediatrics under national projects aimed to improve maternal and perinatal indicators in Ukraine and Moldova.

CESIMED's main challenges have been the availability of instructors with appropriate expertise in simulation-based education and financial sustainability.

Support and advisory on the use of SBME is likely to be the future steps of CESIMED. The ease of conveying useful skills to clinical practice together with flexibility of SBME in adapting to different curricula strengthens participation in projects aimed at improving healthcare.

Future Steps in Portugal

The future of simulation in Portugal is promising as its use is becoming essential to medical education and healthcare staff overall. In the near future SBME will certainly be a mandatory part of education programmes to acquire competences and for continuing education.

Tajikistan

Simulation–Based Medical Education in Tajikistan

The role of simulation-based medical education in Tajikistan has increased since the beginning of this millennium, when it was introduced to teach short resuscitation and obstetrics courses at post-graduate level. Around the same time, the Post-Graduate Medical Institute began using patient-actors for testing family medicine trainees' clinical skills during Objective Structured Clinical Examinations (OSCEs). In the frame of revising undergraduate medical education, the Tajik State Medical University (TSMU) introduced simulation training in 2012 when it opened a clinical skills center as part of Swiss TPH's Medical Education Project (MEP), funded by the Swiss Agency for Development and Cooperation.

The TSMU Clinical Skills Lab

In 2009 TSMU started to develop a new undergraduate curriculum that strives to prepare well-rounded general physicians. Because of the low importance given to clinical skills of graduates under the previous curriculum, the new program had to incorporate clinical skills training earlier in the curriculum and with an increased number of teaching hours. However, a high number of students (more than 7800 in medical faculty) and an inadequate number of clinical placements limit the opportunities for teaching in clinical settings with real patients. To address this issue, TSMU renovated a 1044 sq m facility at one of the university sites to be used as a clinical skills center while MEP funded procurement of equipment.

Most of the laboratory space is used for clinical skills rooms, each containing models related to a clinical specialty: otolaryngology, ophthalmology, pediatrics, neonatology, anesthesiology, resuscitation, obstetrics, and urology. There are also communication rooms, a cardiopulmonary simulator and an ECG room. The core lab-

Figure 8 - TSMU training

oratory team consists of nine instructors, a technician and a director, while teachers of clinical departments visit the lab with their students.

The main challenges for the laboratory include training and retaining of instructors, replacing consumables, and finding equipment with Russian manuals. Most teachers prefer working in the clinical departments where they can see patients. Consumables are not always available and affordable but creative solutions for low-cost options exist, like using skin made from latex gloves for the intravenous injection training arm.

The skills lab is becoming a catalyst for improving clinical skills teaching at TSMU. When the university recognized the absence of agreed levels and procedures for teaching clinical skills, they defined those levels and, subsequently, instructors developed step-by-step skills descriptions to be used for both teaching and testing in all clinical departments. After identifying diagnostic reasoning skills as a weakness in the educational process, MEP organized trainings in building clinical case scenarios around models. These trainings are being rolled out in all clinical departments of TSMU.

With the current increase of emphasis on students' direct exposure to patients, TSMU would like in the coming years to expand the scope of the skills lab to specialties that are currently not covered (e.g. surgery and gynaecology) as well as to post-graduate education (CME and specialty training).

Future Steps in Tajikistan

Simulation-based education plays an essential role in undergraduate medical education. With most equipment donated by development partners, it will be beneficial for the country to focus on simulation tools that are sustainable, share resources among teaching institutiond and maximize the potential of available models for developing clinical reasoning by building clinical case scenarios around them.

1.4 Ukraine Development Approach

This chapter provides an overview of the SBME in Ukraine, available experience, including that within MCHP, and the potential for further development.

SBME development in Ukraine, methodology and implementation

The existing system of medical education in Ukraine certainly is in need of an upgrade – improvement in the level of proficient of medical and paramedical personnel. Leading professionals emphasize the need in training of practical/technical skills, teamwork and communication skills; they also point out that simulation-based education could significantly contribute to these learning objectives[60,52,78]. Many practitioners confirm that they lack the confidence in emergency situations and certainly need new approaches to develop their technical, verbal and team-work skills[35,55].

First SBME Centers appeared in Ukraine in 2006 in accordance with the decree of Ministry of Health[10]. These Centers focused on Basic Life Support skills and aimed to improve the provision of First Medical Aid all throughout the country. Several Centers created in different regions provide their services to both, medical and non-medical staff (firemen, policemen, teachers, drivers, etc.) according to the basic approach[51,69,71,72]. Trainings addressed mainly technical skills and used low fidelity manikins.

In 2012, SBME moved to a new stage of its development in Ukraine with MCHP initiative to establish 4 simulation centers in Obstetrics and Neonatology in Ivano-Frankivsk, Lutsk, Vinnytsia and Simferopol[55,66]. These centers aim to provide training in teamwork, technical and non-technical skills on high-fidelity manikins. The overall

Figure 9 - Simulation Center in Ukraine

infrastructure of the Centers imitates to some extent the clinical settings with medical equipment, consumables, etc. To assure a successful launch, MCHP has developed a concept of Simulation Center establishment based on the St. Gallen Management Model[58]. This concept briefly describes strategies, structures and basic processes, stakeholders, resources, etc. From the very beginning, it served as the basis for negotiations with local partners during the implementation process.

Based on the concept document, MCHP has proceeded with several important activities in 2012-2013[55,66]:

1) Professional capacity building: set of special trainings and further professional supervision for the defined teams – to assure the correct methodology, which is key to effective SBME. For example, core trainers from the regions attended a 3-day training on "Intrapartum Simulation-Based Education" and "Develoment and Implementation of a Training Course" in CESIMED (Porto, Portugal) in April 2013.
2) Regulations: certain existing documents were used as groundwork, and new ones were issued to ensure the proper functioning of the Centers and scope of work for the teams. For example, regional decrees were issued by Health Administrations to form the teams and regulate the training process.
3) Stakeholders: close collaboration with medical universities and local healthcare departmets. For example, faculty members from Vinnytsia and Ivano-Frankivsk medical universities are actively involved in the centers as trainers. Also, universities use Simulation Centers as training facilities for their CME courses. Moreover, key specialists in Ivano-Frankivsk and Vinnytsia are part of training teams.
4) Infrastructure: procurement of certain mannequins (high-fidelity manikins SimMom and SimNewB by Laerdal), selection and conversion of sites, including provision of basic medical equipment and consumables. Simulation Centers were created on the premises of regional hospitals. Their contact information is provided in a separate chapter.
5) Course development: selections of topics, development of simulation scenarios, training agenda and course materials. For example, a course on primary resuscitation of newborns includes several scenarios, related educational sessions, like debriefing and practical skills training, set of handouts, etc. For more details please see Chapter 2.1.

Simulation Centers began providing 1-2-day specialized courses for local medical teams in autumn 2013. Currently, each Center holds 1-2 courses per week. By the end of 2014, the Centers have trained more than 800 medical professionals (data from Crimea was available only till April 2014), which is about 40% of total local medical personnel.

This initiative has significantly increased the interest towards SBME in Ukraine. New simulation Centers were established in some medical universities and regional hospitals, like Odesa Medical University or Zhytomyr Perinatal Center[64,65,70].

Challenges and Recommendations

When establishing a simulation Center, the management should be ready to address the following challenges (based on MCHP experience):

- Selection of team members: higly qualified professionals, interested in training work, etc. (see details in Chapter 2.1). The team has to complete several courses focused on trainer's skills and engage in networking with other Centers in order to share experiences.
- Adequate motivation of team members. SBME is resource-intensive so trainers cannot be volonteers. Their work at simulation Centers has to be either included into ToR, or additionally reimbursed.
- A clear strategy has to be developed for each Center, including objectives, target audience, expected outcomes, workflow, etc. The understanding of the strategy by team members is crusial for effective planning and overal success.
- Scenario and course development is a challenging process that requires a clear definition of learning objectives, development of scenario using special software, creation of materials, etc.
- Recommended clinical aspects for scenarios are:
  - Simple (should not confuse trainees)
  - Realistic, reflecting real-life situations
  - Meet learning objectives / teaching goals
  - Comply with guidelines, standards yet take into acocunt local particularities.
- Rational financial planning: procurement of mannequins should be approximately only half of the total cost. Recurrent costs for the consumables, maintenance, salaries, etc. have to be considered in advance.
- Expectations: SBME is only one of the factors that contribute to the quality of care[15,61]. Simulation course leads to better teamwork, improved clinical performance and adherence to algorithms; however, the causal relation between SBME and better health outcomes is still under investigation[53,61].

Other issues can arise as well; mentioned above are the most critical ones in the Ukrainian context.

Future Steps

Considering the increasing interest to SBME in Ukraine, the tasks for the future could be:

1) Ensuring adequate training / capacity buiding for the teams of newly established Simulation Centers. Certificate of an internationally recognized center might be an option / requirment.
2) Creating national pool of scenarios for common use.
3) Active networking among Centers, including peer-to-peer visits and meetings, national seminars and conferences, participation in international events, etc.
4) Development of public-private partnership or other transparent mechanisms for financial stability of Centers.

In summary, a good foundation has been established in Ukraine in order to proceed with further development and expansion of SBME.

Implementation of Maternal and Child Health Simulation Centers

2.1 Development and Action Plan

a) Establishing a Simulation Center: Objectives

Simulation Center – mission and vision

The mission of a simulation center is to develop current and future healthcare providers' technical and cognitive skills, sustain, refresh and assess their proficiency, as well as educate in new procedures and emerging technologies across all disciplines using state-of-the-art educational methods and technology with an emphasis on interprofessional, team-based training[22,57].

The vision of a simulation center can be variously defined with consideration of its main goal: to improve patient care and safety through simulation-based teaching and the advancement of this educational methodology.

Missions and visions of different simulation centers can be specifically defined and adopted to particular tasks and needs.

Learning goals and objectives

Successful training program/course/module begins with a clear sense of what the program is designed to accomplish[38]. To begin, program goals and objectives should be defined; or outline what program/course/module trainees should know, understand, and be able to do when they graduate. A clear statement of learning goals and objectives serves as the foundation for both, the content of the training program and effective assessment strategy[17,38].

For consistency and ease of understanding the following terms will be used as defined:

- Goals describe broad learning outcomes and concepts (what trainees are supposed to learn) expressed in general terms
- Objectives – specific knowledge, skills, and attitudes trainees should demonstrate that reflect broader goals. Often in the assessment literature, "objectives" and "outcomes" are used interchangeably.

Bloom's Taxonomy is a well-known description of levels of educational objectives. It may be useful to consider this taxonomy when defining objectives. It is named after Benjamin Bloom, who chaired the committee of educators that devised the taxonomy[2].

Bloom's taxonomy divides educational objectives into three domains[5]:

- Cognitive objectives (knowledge) - "What do you want your graduates to know?"
- Psychomotor objectives (skills) - "What do you want your graduates to be able to do?"
- Affective Objectives (attitude) - "What do you want your graduates to think or care about?"

The goal of Bloom's Taxonomy is to motivate educators to focus on all three domains, creating a more holistic form of education[2,3]. Bloom's Taxonomy is considered to be a foundational and essential element within the education community[3].

When writing program objectives, realistic and achievable outcomes should be described

in simple language. Even if a learning objective that is important seems difficult to measure, the language used in wording of such objective should focus on trainee's behaviour. Effectively worded objectives contain "action verbs" that describe definite, observable actions[12,46].

Program objectives should be accepted and supported by department/faculty members. Developing appropriate and beneficial objectives is an iterative process; it's not unusual to go back a number of times to refine objectives. In most cases developing assessment techniques for program objectives makes the need for refining those objectives apparent and helps to make them measurable.

Tasks and functions to be covered

A simulation center has a number of tasks to fulfil in order to make the mission possible and achieve set goals .

Curriculum Development and Training Provision	● Create simulation-based educational programs to serve as outreach to professional organizations. ● Help learners at all levels across all disciplines acquire and maintain cognitive and technical knowledge and skills ● Assist in curriculum development for medical universities and colleges and validation for procedural and cognitive skills ● Provide a safe simulated environment for learning ● Teach and train teams to enhance each member's role and communication
Educational Methodology Development	● Develop and implement new educational methodologies, techniques and approaches
Monitoring and Evaluation	● Complete Initial assessment of trainees ● Conduct assessment of learning ● Conduct satisfaction survey, educational methodology and instructors self-assessment with internal debriefing ● Evaluate impact
Promotion of Patient Safety and High Quality Medical Care	● Quality patient care needs to be emphasized through utilization of evidence-based clinical decision-making and evaluation methods. ● Promotion of patient safety should be an integral part of a training program
Development of Simulation Environment	● Develop and validate new innovations, skill sets and technologies ● Advance the development of medical simulation training and technology through collaboration with corporate sponsors and academic professionals from various non-medical specialties
Collaboration and Research	● Foster simulation research to improve healthcare education, processes and outcomes ● Cultivate relationships between disciplines to impact collaboration and mentorship, improve and enhance the simulation community ● Serve as a resource for other healthcare professionals, educators and researchers in the field of simulation-based educational methodologies
"Train the Trainers"	● Support continuing professional development of trainers ● Enhance teaching and communication skills ● Provide "Train the Trainers" type of courses ● Organize and support workshops for trainers on elaboration of problem-based training programs
Health Care Providers Certification, Revalidation and Remediation	● Support continuing professional development ● Assist in maintenance of certification revalidation and remediation of health care providers

Table 1. **Activities of Simulation Center**

Given the importance and relevance of simulation, and the demands that must be met by health and education policy managers and administrators, it is clear that the development and implementation of simulation must be performed according to an impact-oriented management model[62]. It is important to understand that simulation is an efficient and effective educational methodology only when it is implemented in an appropriate manner.

b) Human Resources

A center for simulation-based medical education should have appropriate rooms, equipment, and infrastructure, but the critical issue for success is the team of trainers. A simulation center should build a team of trainers who have clear understanding of their tasks and objectives. It is often multidisciplinary (such as a team consisting of obstetricians and midwives) and multi-professional (e.g., a team including an Obstetrician, Anaesthesiologist, and Neonatologist). A good team is able to handle problems far beyond the strength of a single trainer. It is able to find a solution satisfying all the parties involved. Proper teamwork reduces the risk of missing important facts and making a poor decision. It helps team members to avoid the so-called routine blindness. One may realize the importance of things that other members of the team fail to see just by the matter of their habits.

Task Force/Profiles description

Staffing and organizational structure of a simulation center depend on its specialization, profile of institution it is affiliated with, and a number of other factors. For example, consider a simulation center that conducts training in the field of Obstetrics. The staff can include the following specialists:

- Instructors (physicians): Two Obstetricians-Gynaecologists (with at least one of them having advanced/adequate experience, training skills and experience in writing scenarios)
- Instructors (physicians): Anaesthesiologist/Resuscitation
- Instructors (midwives or nurses): Total of three/four people with midwife or nurse profile
- Technical Assistant: ICT specialist/Engineer/Computer skills
- Instructor: Psychologist (coaching, briefing and debriefing, can be replaced with a team member having the required skills)
- Administrative: assisting in scenario set-up, simulation center logistics

Most of the team members should be closely and regularly engaged in clinical practice. They should interact with patients, be aware of their pathologies, as well as involved in decision-making and clinical actions on a regular basis. This premise guarantees training sessions with realistic scenarios and dynamics.

The trainers' team-leader should possess a number of skills and qualifications, such as: sound organizational skills and potential for leadership, ability to direct the efforts of all team members towards the common goal, extensive knowledge, ex-

pertise and experience on the given subject; ability to explore an idea and identify its strengths and weaknesses; creative potential and ability to generate original ideas.

In our example of a team of trainers at a simulation center specializing in Obstetrics, the Obstetricians-Gynaecologists would typically do the following:

- Take part in development of simulation scenarios, training modules, checklists, tests, questionnaires;
- Possess good knowledge of applicable regulations, guidelines, and local protocols;
- Teaching trainees and midwives working as simulation trainers;
- Act as Anaesthesiologist in case of his/her absence.

while the midwives working at the simulation center perform the following activities:

- Take part in development of simulation scenarios, training modules, checklists, tests, questionnaires;
- Possess good knowledge of applicable regulations, guidelines, and local protocols;
- Take part in both theoretical and practical teaching;
- Prepare manikins and other equipment for training, and take care about it after the training;
- Make sure that necessary supplies are available.

Midwives and nurses are also participating in testing, and evaluation of clinical scenarios.

Having an anaesthesiologist/resuscitation specialist on the training team helps to elaborate performance of sophisticated scenarios (such as CPR, various types of shocks, haemorrhage, etc.) in more detail, and establish effective multi-professional communication.

Debriefing clinical simulation experiences is widely understood as a crucial step in clarifying and consolidating insights and lessons from simulations. The presence of a Psychologist can help in this process and also in coaching activities. In some cases, a Psychologist also participates in role-playing for scenario trainings.

Having an IT specialist/Engineer on the team to handle various software and hardware issues (as well as programming scenarios for hi-fi manikins) is a must. His/her help and assistance should be available but is not necessary for each training, if other team members have appropriate skills to operate the equipment available in the simulation center.

More information regarding simulation center staff position is provided in section d) Organizational and Institutional. The team shall be encouraged to continuously improve their professional knowledge and trainer skills and should be trained to be able to perform functions of other team members in case of their absence.

Example of training the team of trainers

The MCH Programme has identified simulation center leaders for each region and has requested CESIMED to provide a tailored training taking into account the capacity building and project needs. Simulation instructors have attended a 3-day training titled "Intra-partum simulation-based education. Development and implementation of a training course" provided by CESIMED.

Other examples of training courses for simulation instructors are listed in the table below:

Institution	Course	Website
Center for Medical Simulation - Harvard	**Comprehensive Instructor Workshop**	https://harvardmedsim.org/ims-comprehensive-workshop.php
EuSim Group	**The Advanced EuSim Simulation Instructor Course**	http://eusim.org/the-advanced-eusim-simulation-instructor-course
Medical Education Simulation Center – University of California, Irvine	**Simulation Instructor Training Course**	http://www.medsim.uci.edu/sim_instructor.asp
Society for Simulation in Healthcare	**Certified Healthcare Simulation Educator Workshop**	http://www.ssih.org/Events/CHSE-Prep-Workshops

Table 2. **Simulation Instructors Courses**

Currently, the national system of medical education doesn't provide training to simulation trainers. So, besides providing such training abroad, experience exchanges and mentorship at Ukrainian simulation centers are highly recommended.

c) Infrastructure

This section provides some guidance in terms of infrastructure requirements for a simulation center.

Facilities/Rooms

When selecting premises for a simulation center the following should be considered:

- Autonomous entrance;
- Minimal contact between simulation team and patients in the clinical environment (when simulation center is part of a healthcare facility).

The standards premises for a simulation center are:

1. One simulation (training) room (size ≥ 30 sq m)
2. One observation room (technical / computer)
3. Meeting room (debriefing room) ideally, separated from the simulation room by a big glass window
4. Auditorium (can be combined with debriefing room)
5. Storage room
6. Toilet, wash room
7. General infrastructure:

- Water supply
- Oxygen
- Air
- Suction system
- Adequate lighting
- Electrical outlets

Training Equipment

A simulation center can be equipped with several types of training equipment, e.g., simulation equipment, clinical equipment, and technical equipment. The table below shows types of equipment normally present in a simulation center for MCH.

Type of Equipment	Description
Simulation Equipment	• Manikins • Monitors • Software for clinical scenarios simulation

Clinical Equipment	• Beds/tables : delivery bed (bed transformer), neonatal resuscitation table
	• All real-life devices and medicines (it can be used/out of order equipment and devices, expired drugs):
	  ◦ Monitoring: pulseoxymeter, cardio monitoring device, blood pressure device, CTG, temperature sensor for newborns.
	  ◦ Equipment for providing respiratory support for adults and newborns (Ambu bag with a mask for adult, Ambu bag with a set of 2-size masks for newborns, suction, laryngoscope with a set of blades for adults, laryngoscope with 2-size blades (№ 0 and № 1), with spare batteries and bulbs, bolsters for adult and newborn)
	  ◦ Endotracheal tubes of all sizes with conductors
	  ◦ Mouth airway (for adult and newborns)
	  ◦ Nasal cannulas for CPAP therapy (positive pressure during exhalation)
	  ◦ Nasal cannulas for oxygen therapy
	  ◦ Obstetrical equipment (vacuum extractor, obstetric forceps, set of vaginal specula)
	  ◦ Defibrillator
	  ◦ Surgical equipment for episiotomy
	  ◦ Surgical equipment for suturing
	  ◦ Means for thermal protection of newborns (radiant heating, nappies, hats, socks, blankets, heated mattress, etc.)
	  ◦ Boxes with a set of medicines and supplies for emergency care in such conditions as:
	  ▪ Eclampsia, preeclampsia
	  ▪ Obstetric haemorrhages
	  ▪ Cardiopulmonary resuscitation
	  ▪ Pulmonary embolism
	• Emergency boxes for neonatal primary resuscitation
	• Equipment and supplies for common use:
	  ◦ Medical (disposable) gowns, masks
	  ◦ Sterile and disposable rubber gloves
	  ◦ Box with sterile material (sterile compresses, etc.)
	  ◦ Tweezers, clamp, scissors
	  ◦ Gastric probes (6-8, 16-20 Fr)
	  ◦ Catheters for aspiration of newborns (F10,12,14), disposable rubber balloons
	  ◦ Urinary catheters

Table 3. **Training Equipment**

Type of Equipment	Description
Clinical Equipment	• Stethoscope, neonatal phonendoscope • Hand sanitizer • Ethanol disinfectant (for skin surfaces) • Umbilical catheters (5, 8 Fr) with a set for catheterization • IV catheters for adults - 20 G, 18G, 16G, for newborns 24G, 22G • Infusion systems, infusion solutions (NaCl 0.9%) • System for drainage of pneumothorax • Adhesive plaster • Tourniquet
Technical Equipment	• Video system • Audio system • System for recording and broadcasting (telemedicine)

Table 3. **Training Equipment**

Furniture, accessories and supplies

The example below describes the equipment required to conduct simulation trainings in the field of Obstetrics and Neonatology.

Simulation (training) room

The room should be equipped with properly located basic equipment and devices specific to respective setting (e.g., maternity ward, hospital admission department, etc.) that are required to perform simulation scenarios.

The manikin should lie in bed allowing it to be put in gynaecological position without pulling it down, and obstetric footrests should be kept at the level of the manikin's hips.

It is highly advisable to install, if possible, an audio and video system to allow monitoring scenario performances from the debriefing room and video recording for further evaluation of actions and debriefing. One of the cameras should be placed high in an upper corner of the room to give the wide view (for evaluation of non-technical skills). The second camera should be placed above the perineal area to monitor the manipulations (for evaluation of technical skills). An audio system allows speaking directly from the technical room/booth and imitating patient's voice. A video camera should be also installed above the resuscitation table where newborn care is provided.

Debriefing room

A debriefing room should have the equipment required for short presentations and debriefings, this might include:

- Tables and chairs for ≥ 10 persons
- Data Projector or TV screen,
- Computer (presentations, audio and video surveillance)

Technical room

This room should be equipped with computers with simulation equipment software and other technical equipment. Optimally, the room should be separated from simulation room by a glass window. Surveillance system with cameras and an audio system for imitating patient's voice should also be located here. Each center should have at least one person responsible for the technical condition of the equipment, ideally an IT specialist / Engineer (mentioned in the Human Resources Section of Chapter 2.1).

Supplies and spare parts

These should be located in one designated room. If different medical specialities are involved (e.g., Obstetrics and Neonatology), there should be at least one nurse responsible for storage of supplies.

d) Organisational and Institutional

Regulatory Status: European experience and situation in Ukraine

In 2009, the World Alliance with the support of the WHO published Guidelines for Patient Safety for medical schools, which states that schools must provide a safe and reliable educational environment for learning clinical skills. Simulation training has been identified as one of the ways to achieve this goal.

Simulation center activities are normally guided by respective national laws and regulations of ministries and departments, orders of local government, regional and municipal departments, internal orders of universities and/or hospitals, own statutes, regulations, and orders (see the Portuguese experience description in Chapter 1.3 and Ukrainian experience description in Chapter 1.4).

The described education and training activities in the EU are organized at the national (ministerial, university and healthcare/professional associations) and/or local (healthcare organization) level. Regions as administrative units hold responsibility for the postgraduate and continuous training in some member states of the EU. Simulation-based education on patient safety at the national level stems mostly from the ministries of health and education, healthcare colleges, national institutes/universities, professional organizations, national agencies for quality and patient safety, national accreditation bodies, national regulatory bodies, scientific medical and nurse societies and associations as well as from external consultancy organizations. Local trainings are part of intra-hospital education schemes or other healthcare organizations and institutions. Several examples:

- In Austria, education and training of health workers is within the competence of the Ministry of Health.
- In France, both the Ministry of Higher Education and the Ministry of Health have the legal guardianship of the medical and paramedical education and patient safety etc.
- In Slovakia, patient safety education is partially included in several postgraduate education curricula approved by the Ministry of Health Decree, which establishes minimal standards for study programs, certification programs and continued education. The is-

sues of simulation training and patient safety are also included in medical education and regulated by the government.

- In Hungary, simulation-based training is not directly specified in medical education curricula, but educational institutions are allowed to organize training courses if accredited by the Hungarian Accreditation Committee or the Adult Education and Training Accreditation Board.
- In Denmark, training of specialists is supervised by the National Board of Health. From 2015 on, patient safety will be part of the curriculum for medical students at one university.

Today, simulation-based training in medicine, unlike training in aviation, navigation, engineering and other fields, is barely represented in Ukraine. First SBME centers appeared in Ukraine in 2006 following the decree of the Ministry of Health. They had a clear emphasis on Basic Life Support skills and aimed to improve the provision of First Medical Aid throughout the country. A new stage of development of SBME in Ukraine started in 2012, with the initiative of the Mother and Child Health Programme working towards establishing 4 centers for simulation-based training in Obstetrics and Neonatology in Ivano-Frankivsk, Lutsk, Vinnytsia and Simferopol; operation of these centers is regulated mainly by regional decrees.

The establishment of the Innovation center for practical training of physicians in the Odessa National Medical University in January 2014, by permission of the Ministry of Health of Ukraine, was an important step toward implementing the concept of simulation training in official medical education system at the national level (both undergraduate and postgraduate). The legal status of this center is a "University Department," and it is directly subordinated to the Rector without being a separate legal entity. It acts according to the Law of Ukraine On Higher Education, state standards of higher and post-graduate education, orders and instructions of the Ministry of Health and Ministry of Education of Ukraine, University Charter, academic council decisions, internal labour regulations, University Rector's orders, and other University regulations.

There are some other simulators in private clinics, individual classes in medical school, institute and university departments and faculties, CPR skills practice rooms, as well as showrooms belonging to companies representing medical equipment manufacturers. But thus far, there is a lack of appropriate regulations for their simulation-related activities and integration or even cooperation with the system of medical education.

Relationship to other institutions

Effective collaboration of SBME centers with other institutions contributes to its further development and sustainability. Many institutions, groups, organizations, and individuals might be interested in medical simulation and related scientific implications. In Ukraine, they are as follows:

Healthcare institutions and organizations	Municipal and regional health authorities; district, municipal, regional health agencies: secondary and higher medical educational institutions: National Academy of Medical Sciences, Centers for Disease Control: medical corporations, medical device manufacturers, insurance companies.
Ministry of Emergency Situations	Fire Department, Emergency Services, Emergency Responders..
Ministry of Defence, Ministry of Internal Affairs	Army, Military Troops, Defence Agencies, Border Troops, Navy, Marines, Air Force, Coast Guard, National Guard, Railway Troops; Police, Special Forces.
Providers and Professional Societies	Society of Surgeons, Gynaecologists, Paediatricians, Internists, Nurses, etc.; Organization for the Protection of Consumer Rights, Community Colleges.

Table 4. **Institutions and organisations that might be interested in medical simulation in Ukraine**

There is a big potential for collaboration of different institutions in SBME sphere in Ukraine, following the experience of developed countries.

Healthcare authorities with subordinate institutions, medical universities, professional medical societies and healthcare providers might use simulation centers for undergraduate training (such as in the study of Anatomy, Physiology, Pathophysiology etc.), for residency training, for continued medical education, nursing education, and for competency testing prior to recruitment. Simulation centers based in medical universities and university hospitals might become part of the system of both undergraduate and postgraduate education. Ministries of internal affairs, emergency situations, and defence can use simulation centers to train their staff in emergency medical care skills, including those in combat situations and emergencies.

Some simulation centers are operated by medical equipment manufacturers. Their main task focused on developing and testing new equipment and new solutions, including specialized training for distributors that work with clients and provide consultations.

Two practical examples of collaboration between SBME centers and other institutions in Ukraine:

1. Innovation Center for Practical Training of Physicians, based in the Odessa National Medical University, has already developed thematic courses and certification for many specialties, such as Obstetrics and Gynaecology, Surgery, Neonatology, Anaesthesiology, Paediatrics, Pulmonology, Endoscopy, Cardiology, Intensive Care, Ophthalmology, etc. There are also programs designed specifically for doctors and paramedical staff providing pre-medical and medical aid during military operations and other emergencies.
2. Simulation centers established by the Mother and Child Health Programme meet local needs for training the staff from perinatal centers and district hospitals, and have already induced creation of simulation centers in other clinical facilities throughout Ukraine (i.e. Dnipropetrovsk, Kharkiv, Zhytomyr, Kyiv, etc.). They are currently in the process of establishment and engaging in cooperation with existing centers, governmental and non-governmental organizations, medical education institutions, and health care providers.

Management and supervision

In view of the lack of a legal framework for the implementation and organization of a SBME in Ukraine, this task is the responsibility of the pioneers. There are two types of "pioneers" growing independently that should constitute the basis for successful implementation of simulation approach at different levels of national healthcare system: simulation centers within medical universities and simulation centers within hospitals. So, the management and supervision model in such centers might be different but the goals and instruments used for their achievement have much in common.

The Odessa National Medical University is home to the Innovation center for practical training of physicians, the pioneering center for simulation-based training in a medical university. In the future, the overall legal structure and type of organization of this center can be an inspiration for the creation of similar centers within medical universities throughout the country, with the possibility of teaching both medical and non-medical skills, and training the trainers.

The Director of the Center subordinates directly to the University Rector and is responsible for the management of the center, definition of its strategy, goals, and objectives, planning and coordination of work, development and implementation of curricula and training courses. The University Rector, who also serves as the President of the National Association of Obstetricians, supervises the work of the centers, contributes to its strategy development and assessment of work.

In addition to full-time team members, University employees from other departments are also involved in consulting, design, planning, research, and tutorial work, thereby providing interdisciplinary integration and interaction between University departments. These co-workers receive remuneration according to the number of hours worked for the center.

Another type of the legal structure and management is represented by 4 simulation centers established by the Mother and Child Health Programme. These centers legally belong to and are located in the regional hospitals. Specific team, rooms, and equipment are assigned to each center.

The work of these centers is regulated by the decrees of regional Health Administrations and by hospital management's internal decrees. These decrees mainly define:

- Individual composition of the team; team leader
- Responsibilities of team members; remuneration for the team (where possible)
- Average workload of the team; training frequency
- Trainings' main target audience and key topics
- Approximate plan of work for upcoming period

A team leader is the main responsible person, who manages the work of the team and reports to the hospital management. The leader forms the final curriculum, training plan, working schedule of the team members, etc. An administrative assistant supports the leader with organizational and financial issues. Financial sustainability of the centers is mainly

assured through co-funding by hospital management (providing premises, work hours, etc.) and participants (nominal fee to cover the disposables during the training).

The leader collaborates closely with the hospital management, leading regional specialists (in this particular case – leading Obstetrician and leading Neonatologist), and with relevant departments of local medical universities (if available in the region). Thus, operation of a simulation center is tailored to the real needs of the region.

There is also a set of tools to assess the performance of simulation centers. The conducts a routine monitoring, mainly based on collection of questionnaires from the participants: pre- and post-tests, satisfaction, self-assessment, etc.; number of participants trained in a certain month, on what topic, from what facilities, etc. Regional chief specialists also handle the external supervision. Peer-to-peer supervision among the teams of the centers was also established within MCHP; regular meetings of teams from different regions support them in further development.

Simulation center staff positions

The educational process in simulation centers is carried out either by personnel from teaching departments of the institution or by invited practitioners who have been specially instructed and / or trained on the specifics of simulation training. For sustainable and effective work of the SBME center provision of official work positions for the team members is strongly recommended. This may be done in several ways:

1) If allowed by legal statute and structure of the institution: official work positions with respective salary; full or part-time positions might be provided.

Position	Main duties
Director/Leader	Management of the center; definition of the center's strategies, goals and objectives ; planning and coordination of work; development and implementation of programs, curricula, courses.
Assistant Director (optional)	Educational processes; planning activities; analysis of center results; control documentation; liability.
Methodist/ Administrator/ Manager	Organization of methodological work; completing educational groups; development of teaching and learning materials; drafting educational, training and learning plans.
Instructors / Trainers	Organizing and conducting training and educational activities; scientific and research activities.
Psychologist (optional)	Designing plans and social development programs for training, debriefing. Training, debriefing, coaching.
Software Engineer/ System Administrator/ Technician	Software training; computer maintenance; controlling the use of network resources; ensuring smooth operation of the network; IT-support; installation and commissioning of equipment; introduction of new technical solutions.

Table 5. **Team staff example**

2) If the official "educational work positions" within the facilities or the financial means to cover the salaries are not available: update the existing Job Description (JD) for the team members allowing them to officially spend part of their working time on the SBME center.
3) If there is no possibility to update the JD and no financial means: allow the team to work overtime and introduce fee-for-service paid by the participants of the courses.

Table 5 shows an example of staff on a team. The number of regular units can vary depending on the size and center performance. More information on Human Resources of the SBME centers is also provided in Chapter 2.1(b).

e) Curriculum Development

Curriculum is broadly defined as the totality of student experiences that occur in the educational process. The term is also used when specifically referring to a planned sequence of instruction, or to a view of the student's experiences in terms of the educator's or school's instructional goals[33,77]. In the context of simulation centers we refer to curriculum as the detailed description of the training programme that can include trainee's qualification, learning goals, content, pedagogical methodologies, scenarios, total duration and schedule, minimum criterion for frequency, trainee's assessment tests, if applied, and resources to conduct training.

Setting goals and objectives

Before developing curriculum for a simulation-based medical training, we need to:

- identify the target audience of trainees;
- clearly define the main learning objectives; according to identified problems and weaknesses or upon request;
- link them to other possible interventions that can help achieve these objectives.

Generic and targeted program

To integrate simulation-based training into the general system of activities aimed at achieving goals, a "generic" program" or "targeted" program has to be developed.

Developing a generic program means designing a training programme based on simulation training potentialities, such as training of technical skills and non-technical skills according to management guidelines. A generic program is aimed at achieving a specific goal, such as improving the quality of care provided to patients with postpartum haemorrhage, or teaching primary healthcare physicians how to use an otoscope. A generic program is oriented towards the results of a specific healthcare facility or clinical entity.

A targeted program is aimed at improving the results in a certain field of healthcare (improving the quality of healthcare services in perinatology, for example). To develop a targeted program, a primary assessment should be conducted in order to define the goals of training and activities required to improve the situation

(e.g. analysis of cases and outcomes associated with specific care; analysis of medical-related legal claims, etc.). A targeted program is developed and implemented as a consistent project, and includes the following steps:

- situation assessment;
- program development;
- pilot project implementation;
- monitoring/observation;
- adaptation/improvement;
- dissemination;
- impact assessment (related to education or healthcare provision).

Example of curriculum development for simulation centers: Mother and Child Health Programme experience

Simulation centers established by the Swiss-Ukrainian Mother and Child Health Programme started from developing a targeted training program. The main objective of training was defined as improving the quality of perinatal care. The target audience included Obstetricians-Gynaecologists, Midwives, Neonatologists, and Nurses from Maternity departments. Before developing the curriculum, a workgroup of simulation trainers and experts analysed the statistical data on morbidity and mortality rates in the pilot regions. Taking these data into account, several clinical conditions were selected that involve a high risk of morbidity or death. One important part of curriculum development is to define scenarios for simulation-based training. Some examples of MCHP scenarios can be seen below:

Obstetrics	Neonatology
Cardiopulmonary resuscitation Fetal distress Postpartum haemorrhage Preeclampsia and eclampsia Shoulder dystocia Pulmonary embolism	Primary neonatal resuscitation: Primary resuscitation (clean amniotic fluid) Primary resuscitation (meconium fluid) Full resuscitation (clean amniotic fluid) Resuscitation of preterm newborns Providing care for newborns with respiratory disorders: Moderate respiratory disorders Severe respiratory disorders

Table 6. **Example Scenarios**

Training curriculum

Training curriculum is a detailed step-by-step description of actions to be performed during a training session. Development of a training curriculum allows setting, standards for the training process (to a certain extent) regardless of where and by whom it is performed. Generally, training curriculum should include the following components:

1. Theoretical and technical training tasks (diagnosis, creating treatment plan, performing certain actions, etc.);
2. Non-technical training tasks (communication with the patient and his/her family, communication between team members, non-verbal communication);
3. Scenario (objective data, medical history, results of clinical and laboratory interventions, etc.);
4. Techniques, technologies (equipment) and materials (list of all necessary equipment for providing care and simulators required to perform a certain scenario);
5. Human resources and roles (instructors, technical specialists);
6. Roles of the trainees;
7. Description of the starting point of scenario;
8. Description of the expected exit point;
9. Debriefing.

Development of clinical scenarios should be based on recommendations of evidence-based national and local protocols and international recommendations on management of specific conditions. However, playing a simulation scenario involves not only performing a certain sequence of actions required to provide care and learn technical skills, but also practicing team-work (interdisciplinary cooperation).

Debriefing

Debriefing is a special kind of feedback process that promotes critical reflection and constructive discussions about the practical experience, trainee's performance, behaviours and decision-making. It is a crucial step in clarifying and consolidating insights and lessons from a simulation event. In this activity, the instructors shall ensure the following:

- Participants feel that they are in a confidential and respectful environment, allowing the exploration of emotions and avoiding frustration;
- All participants contribute to debriefing by having a chance to explain their actions and report their difficulties and questions during the scenario.

Objectives	Safe and confidential Identify Impact Inclusive language/Avoid blame Include all in group discussion Event review Clarify facts Recall what happened
Activities	Review simulation events (e.g. video recordings, checklists) that will not be published Sort out and clarify thinking Release emotional tension Reinforce specific teaching points Correct misconceptions Key questions: What happened in the simulation? How did you feel about that? How did the group's actions compare with the standard guidelines?

Table 7. **Debriefing Objectives and Activities**

Debriefing can also be seen as an evaluation technique. During a debriefing, participants analyse their actions, determine successful and unsuccessful actions, assess the quality of care and its compliance with current guidelines, and determine the need to change the existing practices. Debriefing objectives and some examples of activities are described in the table 7.

Training modules that should be defined in a curriculum

Since simulation training is a part of postgraduate educational system, its requirements were taken into account when developing simulation scenarios for Ukrainian centers established by the Swiss-Ukrainian Mother and Child Health Programme. This is why the scenarios were transformed into training modules. Such modules deal with all issues involved in developing a scenario, and include a theoretical part with a presentation. Generally, a simulation training module consists of the following parts:

- Substantiation of the clinical expedience of this scenario;
- Identification of the target audience for the training;
- Training objectives with description of theoretical knowledge and practical skills which participants should acquire as a result of the training;
- Sequence and duration of actions to be performed during the training session;
- "Assessment of knowledge and skills / certification" section describes the criteria of evaluation;
- Theoretical part includes a presentation and text description of the theoretical knowledge that should be obtained by the participants, as well as tests for assessment; in some cases this part is eliminated depending on the training objectives;
- Practical part, which is the actual clinical scenario describing the changes of the patient's condition depending on the actions of trainees, and a checklist for evaluation of their compliance with an algorithm;
- Debriefing section contains a sample list of questions that should be used to help the trainees assess their own actions;
- Appendices that may contain modern algorithms of care provision, detailed descriptions of specific procedures performed during the simulation, etc.

Each module is integral and complete, so that it can be used separately or as part of a larger course of training .

Given the busy schedules of health professionals, the Mother and Child Health Programme established its simulation centers in Ukrainian healthcare facilities, and curricula were developed for one and two-day trainings (see example of one-day training in section f) Training Provision). Interdisciplinary teams of experts from one or more institutions are invited to participate in the training. Performance is evaluated at each stage of a training. Upon successful completion of the entire course a trainee is awarded with a certificate. More information regarding evaluation is provided in Chapter 2.3 Monitoring and Evaluation.

Curriculum writing is important in order to allow smooth training organisation and progress, avoid voids during trainings, as well as for smooth dynamics of scenarios, for purposes of clinical realism and for getting close to teaching objectives. Curricula should be agreed among teachers in a team and should exist in written form, e.g. a pedagogical dossier.

f) Training Provision

General tasks

Simulation centers conduct training with the help of simulation equipment (manikins and other simulators) in accordance with approved standard simulation modules (SSM). A SSM includes a list of practical skills that should be acquired (or tested) as a result of the training. It makes sense to break skills listed in a SSM into groups by various principles – by subject, by the equipment involved, and by achievability of training objectives. Besides clinical SSM's, there is a need to develop a special curriculum for training of new simulation trainers. Standard simulation training modules can be implemented in the form of standalone trainings, and/or as part of a larger simulation training course.

As mentioned before the most important step is to plan, develop and write the curriculum that will define all teaching activities and connected aspects. Curriculum is also important to help students to acquire the appropriate skills, should clearly define goals and objectives and set indicative terms to be met.

Several multidisciplinary SSMs can be used together to conduct a training on one topic. A training conducted in accordance with the SSM should include the following four parts:

1. Introduction: pre-test + familiarization + goals setting
2. Scenario playing
3. Debriefing+/- short review of theory
4. eventually scenario replay + post-test + assessment

Guidelines for organization of training

The goals and objectives of simulation training should be determined as clearly as possible, according to the needs and qualification of students as well as public health or educational priorities. Also, we should clearly define the list of requirements for knowledge and practical skills that students should have to be eligible for this training. Development of simulation training strategy follows mostly recommendations such as: Cooperation on evidence-based medical education (BEME Collaboration) (Issenberg, 2005). According to them, the key aspects of simulation training are:

- provide feedback to students based on the results of their training;
- opportunity to practise skills repeatedly;
- integration into the curriculum;

- option for students to choose the level of complexity;
- adaptation of training according to the needs of students;
- diversity of clinical situations;
- safe training environment – for both patients and doctors/nurses: can make mistakes without causing any real harm;
- individualization of training;
- definition of learning goals and objectives;
- use of adequate-level technologies.

In the table below. You can see an example of a one-day training agenda:

08:30-08:45	Registration
08:45-09:00	Presentation. Introduction of trainers and trainees
09:00-09:30	Training objectives. Discussing of learning objectives with trainees
09:30-10:30	Introduction to simulation training, getting familiar with manikins and other equipment
10:30-10:45	Coffee break
10:45-11:00	Pre-test (this is optional and depends on learning objectives, monitoring and evaluation framework in place)
11:00-11:15	"Hands-on session". Performing Simulation Scenario 1
11:15-12:00	Debriefing – Simulation Scenario 1
12:00–13:30	Lunch
13:30-14:30	Master-class on a relevant topic (this can be optional, normally done for complex topics)
14:30-14:45	"Hands-on session". Performing Simulation Scenario 2 (can also be re-playing of the Simulation Scenario 1. This depends on the training learning objectives)
14:45-15:30	Debriefing – Simulation Scenario 2 (or second debriefing of repeated Simulation Scenario 1)
15:30-15:45	Coffee break
15:45-16:00	"Hand- on session". Performing Simulation Scenario 3
16:00-16:45	Debriefing – Simulation Scenario 3
16:45-17:15	Post-test (this is optional and depends on learning objectives, monitoring and evaluation framework in place)
17:15-17:30	Final remarks

Table 8. **Example of one-day training agenda**

Target indicators

An important condition for successful operation of a training center is a system for evaluation of its activity results. The system should include qualitative and quantitative criteria for evaluation of efficiency of teaching activities, instruments and procedures.

Quantitative = i.e.: number of training sessions, number of people trained.

Qualitative = evaluation system should be based on the requirements of professional standards, on evidence-based medicine data, and finally (in the absence of the above), on opinions of leading experts in the field + number of positive feedback by attendants.

While preparing for the training, it is necessary to set performance standards (ideal criteria) that have to be accomplished (demonstrated) by participants which means that the performance of the center will be assessed based on the performance of trainees, or, better, the improvement of performance during teaching sessions – a dynamic evolution of skills have to be demonstrated:

- clinical assessment skills (diagnostics, understanding of situation and condition)
- clinical actions and reactions (therapeutical measures)
- understanding clinical response to previous implemented actions and adaptation to its dynamic evolution
- teamwork, communication and leadership capacities

It is also advisable to take into consideration the possible typical mistakes and prepare evidence-based arguments and illustrations of the consequences of such mistakes for the debriefing. Lowering the incidence of mistakes made by trainees during training sessions would be an indicator of efficiency.

Operation and efficiency of a simulation center is generally defined by two interrelated and interactive aspects: educational and social. The following should be assessed:

- knowledge
- clinical actions
- interpersonal dynamics/attitudes

Objective indicators for assessing these are difficult to find but they should mainly be comparing initial performances with later ones, e.g. checklists, trainee self-assessment during debriefing. Plans for correction of further activities and further development should be based on the results of monitoring. More detailed information can be found in Chapter 2.3 Monitoring and Evaluation.

A simulation center should control the quality of training provided to its students (i.e., success in acquiring practical professional skills), and try to improve this quality by studying and implementing modern experiences and best practices in the domain of simulation-based medical education.

2.2 Resource Requirements for Simulation Centers

Establishing and running a Simulation Training Center requires a significant investment of financial and human resources. This chapter provides an overview of costs and cost coverage methodology, describing an approach that can help to ensure sustainability, operation and further development of a Simulation Center.

Costs

Costs associated with the establishment of a Simulation Center can be divided in two categories: one-time costs mainly related to initial acquisitions, and recurrent costs related to the operation and maintenance of a Simulation Center.

One-time costs/investments may include:

- Allocating or building premises required for operation of a Simulation Center (such as rooms for simulation, debriefing, storage, etc.). These rooms may often require renovations and reconstruction in order to provide appropriate layout and infrastructure (install wiring, piping, power supply sockets, glass windows for observation, booth for engineer/operator, etc.) – see Chapter 2.1 for infrastructure requirements;
- Purchasing manikins and other simulation equipment included in the delivery set (such as spare parts, compression pumps, monitors, notebooks, control devices, and other accessories);
- Purchasing or allocating:
  - appropriate furniture, such as hospital beds, cabinets, tables, chairs, etc.;
  - medical equipment (real or imitation) required to perform simulation scenarios and provide a realistic environment in the simulation room;
  - Video/audio, computer and office equipment (e.g. multimedia projector, screen, speakers, video cameras, printer, etc.);
  - additional software required to perform simulation scenarios or for technical needs (if necessary);
- Expenses related to the initial training of trainers and other personnel (travel, tuition fees, salaries for the period of training, etc.).

Recurrent costs can include:

- Salaries for trainers and assisting personnel (reimbursing for the time spent on trainings, preparations and other relevant needs) – see Chapter 2.1 for staffing requirements;
- Purchase of consumable materials (such as lubricants, robes, gloves, syringes, etc.);
- Paper and toner (or cartridge) for printing/copying handouts and other materials provided to trainees;
- Travel costs for trainees from remote areas;
- Accommodation for trainees from remote areas (when staying overnight);
- Expenses for coffee breaks for staff and trainees;
- Equipment maintenance, repairs (including cost of labour and spare parts), and depreciation;
- Utility bills (electricity, heating, water, etc.); Expenses related to further training, education, and skill advancement for personnel (travel expenses for attending courses, workshops, conferences; tuition or registration fees; other related expenses).

Sustainability and Operation of Simulation Centers

Funds required to establish and run a Simulation Training Center go far beyond the cost of mannequins and other simulation equipment per se. Sources of funds that can be used to cover all these expenses may depend on the type and status of a Simulation Center – whether it is part of a healthcare facility (such as clinical hospital, perinatal center, etc.), educational institution (such as medical university or academy of post-graduate education), or an independent institution. Different sources of funding are presented in the table below:

Source	Description
Institution Budget (own funds)	E.g. staff positions and salaries for trainers and other personnel, assuming they spend a certain share of their work time on activities related to the operation of a simulation training Center;
External Funds	Such as grants, sponsorship, funding from international projects and its stakeholders (see Chapter 2.4), etc.
Institutions/Authorities	Organizations that want/need to have staff trained
Trainees	Funds provided by trainees themselves
.....	.....

Table 9 – **Sources of Funding**

2.3 Defining a Monitoring and Evaluation Framework

A number of documented models approach evaluation of learning based on a study of learning levels or analysis dimensions, each of which has its advantages and disadvantages. A range of models used for evaluation of learning is mentioned in specialized literature. Some of these models focus on specific aspects and others (like the training management model) use a comprehensive approach.

The Kirkpatrick model provides an initial educational foundation, given its simplicity and viability - two basic factors in impact evaluation studies[34,47]. The Kirkpatrick's model measures the effectiveness of training using four outcome levels: trainees' reaction to the training, learning during the training, impact on on-the-job behaviour and impact on results. Phillips adapted Kirkpatrick's model to include return on investment and thus provides a higher level of analysis of the financial impact of the training (The Phillips[48] model). Other model providing a higher level of analysis includes the financial impact on training it the Wade[73] model.

Miller's Pyramid[41] and the PRIME model[50] offer tools and levels for the evaluation of learning in clinical practise and are often used in trainee performance evaluation.

Other models are oriented towards the analysis of factors that influence the transfer of acquired competencies to the workplace and thus enhance evaluation of training impact. Holton[68] offers a series of factors related to motivation, environment and capacity for realization of the transfer. While Tejada[29], identifies a series of conditioning factors prior and subsequent to training which may affect the success of the transfer. The impact evaluation model[63] is aimed at measuring the results some time after the training activities, and the effects that these have produced in the workplace and in the organisation.

Some evaluation models focus exclusively on training results failing to take into consideration aspects circumstantial to the evaluation itself, such as those related to the context, generated income, or the processes[19,59].

A training management model integrates different evaluation models (Table 10). It implies a process-focused approach to evaluation that takes into account the training process as a whole, from identification of requirements to the long-term effects on individual or institutional activities, or on the sectors and regions that benefit from these activities.

Like other evaluations, impact evaluation is considered to be lacking in methodological basis for objective assessment and assurance, as well as more immediate results (reaction evaluation – satisfaction) or results evaluation (literally) i.e. increase in competencies, knowledge, skills[63].

The perception of changes that may occur in clinical practice as a result of simulation may be influenced by a multitude of environmental and individual factors that affect transfer and, indeed, credibility of the measurement in itself.

It is crucial for every Simulation Center to establish a conceptual framework as a reference for design of models for evaluating the impact of simulation-based training experiences, particularly on the scale of training programs.

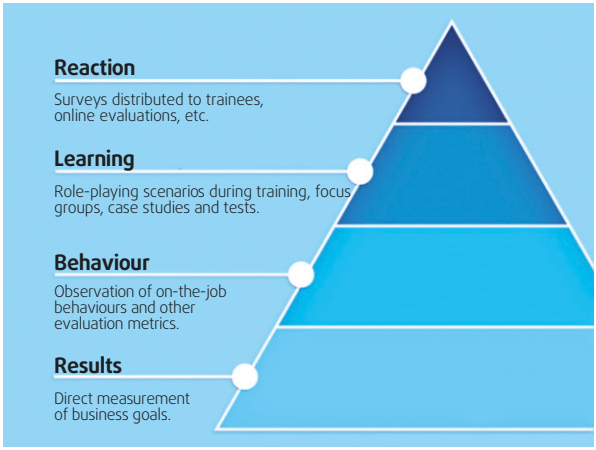

Figure 10. **Kirkpatrick's Levels of Evaluation**

Domain	Description	Tools
Initial assessment of trainees	**Professional and Demographic profile** • Age, sex, name of Center, region, clinical practice/ area of study • Prior training: prior healthcare experience, general level of knowledge, prior knowledge of simulation scenario content, perceptions of prior experience of clinical simulation (positive and negative), trainees' confidence regarding content and required skills for the simulation scenario	Survey (questionnaire)
	Motivation and expectations • Expectations regarding the simulation training • Personal interest in simulation experiences	Survey (questionnaire)
	Competency requirements • Competency requirements to be developed by trainees during training: trainees' perception of skills, knowledge and attitudes to be gained i this type of training	Survey (questionnaire), feedback reports, simulations (observation, video recoding)
Learning	**Evaluation of learning results in relation to simulation experience:** • Increase in skills (%) • Increase in knowledge (%) • Increase in attitudes (%) • Average progress • Clinical judgment/decision-making: development of critical thinking **Communication/collaboration with team. Team interaction.**	**Cognitive domain** (knowledge): initial and final tests, practical exercises in situ **Psychomotor domain** (skills): direct observation, video recording, list of behaviours, simulator reports, practical exercises in situ **Affective domain** (attitudes): Likert-type questionnaires, self-feedback, observation
Satisfaction, educational methodology and instructors	• Overall satisfaction with simulation experience • Pertinence: simulation experience responds to needs and expectations • Usefulness: module provides knowledge and develops skills that are applicable to clinical practise • Quality of course design: perceived quality of simulation activity, correspondence of objectives with content • Deliberate practice: possibility of repeating technique during a session, levels of difficulty, degree of concentration adopted, perception of degree of dedication to the activity, etc. • Orientation towards team work: level of satisfaction with learning • Feedback orientation: satisfaction with instructor monitoring, feedback and feedback quality • Scenario characteristics: suitable number of trainees per scenario, staff distribution, scenario fidelity and complexity. Time available for simulation experience, feedback, methodologies, etc. • Environmental conditions during simulation experience: noise, physical conditions, time estimated by trainees for learning tasks, time available for simulation experience **Development of instructors' competencies: trainee perception of instructors' experience level**	Survey (questionnaire)

Table 10. **Training management model for evaluation of simulation-based learning**

Domain	Description	Tools
Impact	**Impact evaluation: comparison of "before" and "after" situations to reveal changes that may be attributed to training.** • Individual: analysis of self-efficacy, self-confidence, critical thinking/decision-making, clinical judgment and improvement in the socio-professional performance of the trainee. • Organizational: improvement in service as well as the quality of patient care and safety, health indicators, human resource indicators, improvements in organizational capacity for research as well as clinical activity costs and variance. • Healthcare community: improvements in community hospital services, quality of patient care, health and human resource indicators.	**Individual:** • Questionnaire regarding the impact of the simulation experience on the performance improvement of trainees, superiors and co-workers **Organizational / Healthcare community** • Wide-ranging interviews with trainees, superiors and co-workers regarding improvements in result indicators in the organization • Hospital records and documents • Health statistics/indicators

Table 10. **Training management model for evaluation of simulation-based learning**

2.4 Engagement with Stakeholders

In most countries establishment of Simulation Centers means taking on an innovation initiative. Such projects call for careful planning, which includes definition of objectives, design of implementation strategies, conducting risk analysis, project management setup and defining resources required to achieve the set goals – these are some of the most important aspects of planning. Making resources available is one of the critical elements in launching and managing a development project. Effectively, development projects are "joint ventures" and collaboration networks that need to be managed respectively. The chapters below outline the importance of systematically reflecting on the "contributors" to the innovation initiative called the Simulation Centers.

Type of Party	Description	Typical for Clinical Skills labs
Key stakeholder	Without their support and participation targeted result cannot be achieved (nor the project can be vetoed).	State Postgraduate Academy, MoH, Regional Medical Administrations
Primary stakeholder	Parties directly affected by or involved in the project; either as beneficiaries (gainers) or "losers" (negative consequences)	Regional hospitals and/or university clinics, departments and institutions of medical education (postgraduate and undergraduate)), professional medical societies and groups of interest, ...
Secondary stakeholder	Those actors whose involvement is only indirect or temporary.	Financing bodies (donors, national funds, ..) Foreign institutions (e.g. Simulation Centers, European Association of CSL, etc.)

Table 11. **Classifying Stakeholders**

In a wide sense stakeholders are contributors to the success or failure of a project. They can be defined as parties that are linked through a shared interest in achieving a common objective. The need for institutional anchorage and long term support should be taken into account when identifying stakeholders. Collaboration with various parties is rarely a straightforward and easy process since different parties have different backgrounds, views, interests and long-term goals. This means that the collaboration network needs to be professionally steered to be performant. For this, specific information on each party is required right from the beginning. As Figure 11 suggests, it is important to classify types of stakeholders according to criteria that inform the project manager about their individual functions and potential contributions to the project development (see Table 11).

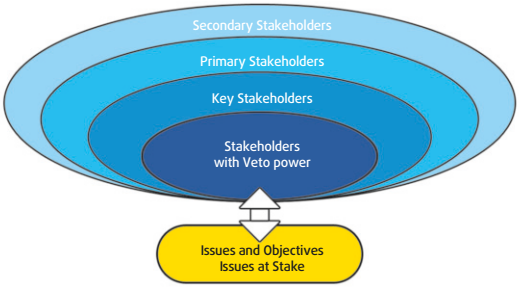

Figure 11 – **Relation of types of stakeholders to project issues and goals**

Once the stakeholders have been identified, their potential for the project should be analyzed further by using an outline suggested in the Table 12 below:

Stakeholder	Interest/ stake	Importance
Medical University	Adopting new knowledge and skills. Image gain through offering new technologies and method that other schools do not have.	Important resource to serve as platform for pilot test. Workforce available to elaborate scenarios.
Eurasia Investment Fund	Placing investment money in promising innovative projects.	Key funding organisation. Provides critical capital investments for simulation equipment.
...	...	...

Table 12. **Stakeholder analysis tool**

Further, it is useful to analyse different contributors against the types of resources they can bring into the joint venture: a) financial resources, b) topic knowledge and expertise, c) political and regulatory power (setting rules and norms, giving regulatory approvals), d) access to relevant opinion leaders and decision-makers and the last but not least e) human resources (multi-professional group of well-educated and highly motivated specialists, capable of devoting their knowledge and time to creation and advancement of a Simulation Center).

Collaboration with Stakeholders

After a collaboration network is established, it needs to be promoted, steered and maintained. The level of effort and energy required to nurture a group of contributors is frequently underestimated. Figure 12 outlines important areas of activities to be undertaken to ensure effective and beneficial collaboration.

Create common structures

1. Agree on binding terms of engagement
2. Fomulate shared objectives as milestones
3. Define rules for conflict management

Processes and quality of collaboration

1. Identify and understand different interests and expectations
2. Create mutual trust
3. Make lessons learned and success stories visible

Figure 12. **Critical aspects of successful partnership**

Once a new cooperation relationship has been established, activities need to be planned to nurture this relationship. Informal meetings are as important as formal ones (e.g. regular review meetings and management meetings) and mutually agreed work processes. Regarding the introduction of Clinical Simulation Centers in countries where this technology is not yet present, joint visits to Simulation Centers in other countries or participation in international conferences has proven to be a good means of aligning interests and building trust among stakeholders.

2.5 Implementation Phases and Time Plan

This section gives an overview of implementation steps and phases for the establishment of a Simulation Center. Guidelines for setting priorities, roles and target groups along with suitable time plan for the implementation are provided.

Implementation Phases, Prioritization and Time Plan

The main phases for establishing a Simulation Center are as follows:

- Defining Objectives – Define vision, learning objectives and tasks/functions to be covered.
- Human Resources – Training of trainers, professionals: clinicians, midwifes, nurses, IT and maintenance engineers (managers, support and maintenance of equipment).
- Infrastructure and Technology Management – training equipment and maintenance, user training, equipment operation, IT support, application support (scenario development), standards for facilities, auxiliary medical equipment, furniture, supplies and consumables.
- Organizational and institutional development – Develop mission statement and objectives, role clarification, staffing and organogram, financing, job descriptions, regulatory status, relationship to other institutions (e.g. universities), management and supervision, define key governance processes.

- Curriculum development – Scenarios, organization of simulation courses, didactic methodologies.
- Training Provision – training schedules, guidelines for training organization, performance targets, business plan.

The phases described have different priorities, e.g. it doesn't make sense to procure equipment if the learning objectives aren't yet outlined or if financial support hasn't been defined. Figure 13 below describes the priority that shall be given to each phase and the order of activities.

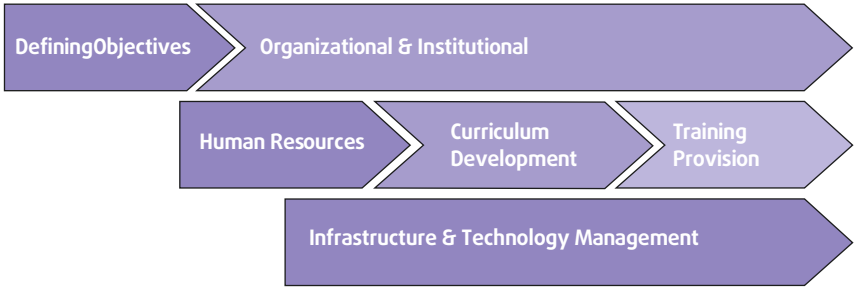

Figure 13. **Implementation Phases priority**

A time plan for establishing a Simulation Center can be easily created based on the diagram above. Milestones should be extracted from the implementation phases and translated into a time plan. Milestones allow for being aware of the progress of implementation even for someone not familiar with the tasks being performed. They have zero duration because they symbolize an achievement, a point of time in the implementation. An example of a time plan and milestones can be seen in the table below:

#	Description	Indicator	Year/Month											
			1	2	3	4	5	6	7	8	9	10	11	12
1	Objectives and vision defined		X											
2	Regulatory status settled													
3	Training teams defined			X										
4	Equipment Procurement				X									
5	ToT					X								
6	Equipment Arrival (Installation& Training)							X						
7	Curriculum developed											X		
...	...	...	.	.	.	.	.	.	.	.	.	.	.	.

Table 13. **Milestones and Time Plan**

Planning of Roles and Activities

It is important to define task force for each implementation phase in order to better manage available human resources. Finding specific expertise in a country can be difficult. Therefore, it is very helpful to the overall planning and engagement of strategic partners, stakeholders and International experts to assign accountable persons to each activity and define additional human resources. Since activities can vary at each implementation phase, we suggest structuring different activities and respective task force per implementation phase, as shown in the Human Resources table below:

#	Activity	Who and How	Task Force
1	Creating Simulation Center Team	Project Manager & Hospital Manager	1 Midwife + 1 Obstetrician + 1 Neonatologist + 1 IT/Engineer + 1 Administrative
2	Training of Trainers	Project Manager + Training Team Leader - Research on ToT providers	ToT Provider + Training Team
3	Training on Simulation Equipment (Eng/IT)	Equipment Manufacturer - Provide trainings onsite	Engineer/IT responsible by equipment maintenance and scenario set up + Manufacturer Trainer
4	Training on simulation equipment (Instructors)	Equipment Manufacturer - Provide trainings onsite	Training Teams + Manufacturer Trainer

Table 14. **Phase activities planning**

Contacts of MCH Simulation Centers

Contact information for Simulation Centers established in Ukraine by the Swiss-Ukrainian Mother and Child Health Programme:

Lutsk Simulation Center

Location: Volyn Children's Territorial Medical Center (30 Vidrodzhennya Prosp., 43024 Lutsk, Ukraine)

Contact persons:

- Obstetrics: Dr. Andrii Zagrebelnyi
  (email: zahrebelniyand@gmail.com; phone: +380505815674)
- Neonatology: Dr. Tetiana Zagorulko
  (email: zagorulkodoc@ukr.net; phone: +380671254527)

Ivano-Frankivsk Simulation Center

Location: Ivano-Frankivsk Oblast Perinatal Center (47 Chornovola St., 76018 Ivano-Frankivsk, Ukraine)

Contact persons:

- Obstetrics: Dr. Liudmyla Kovalchuk
  (email: liudmylakovalchuk4@gmail.com, phone: +380997232917)
- Neonatology: Dr. Liudmyla Tachynska
  (email: lyuda_if@ukr.net ; phone: +380661781023)

Vinnytsia Simulation Center

Location: Vinnytsia Oblast Clinical Hospital (46 Pyrogova St., 21018 Vinnytsia, Ukraine)

Contact persons:

- Obstetrics: Dr. Inna Kukuruza
  (email: inna_kykyryza@mail.ru, phone: +380677858939)
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