

PREPARING STUDENTS FOR REAL MEDICAL INTERACTIONS – FUNCTIONAL DESIGN OF A LOW BUDGET SKILLS

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Abstract: Aims: to implement, in academic medical teaching, a design of learning relaying mostly on peers education and capable to train students from the first year of study in basic medical skills. Method: reviewing the updated literature, adapted to the local existent conditions, strongly based on scientific medical evidence, it was conceived a teaching system, in a patient holistic approach, using low budget resources, Results and Discussions: a book of protocols was conceived as a learning working tool, a skills center was organized and didactic dummies were developed using low cost solutions. Available human resources were organized in a peers system of education for a maximal efficiency of a "do – receive – assess – feedback – teach - coach" concept of education. Conclusions: the described system of peer's educational involvement had succeeded to create a functional working based learning environment, using low budget and limited human resources.

Keywords: clinical skills, feedback, peer, low budget, simulation

Students benefits most from medical teaching they are directly involved in. [2] For a student, the best learning situation is to be engaged in a direct medical maneuver with a real patient that have the medical problem aimed to be studied, while being closely coordinated by a specialized teacher. [5, 7] This condition is very difficult to be reached in a real academic life, where there are limited numbers of patients, them diseases not always matching with the medical disorder scheduled to be learned at the specific curricular moment. It is also difficult, for a university, to pay as much teachers as needed in order to have a one to one teacher-student relationship, an individual learning process in which one teacher to taught only one student, once. [4]

By simulating medical conditions and employing didactic dummies, parts of these impediments can be over passed. Configuring a simulated teaching environment can be very expensive but satisfying solutions can be obtained even with low budgets. The biggest challenge is to create a system in which all the taught students to be involved in academic activities at every moment of the whole duration of a class, by performing a learning effort in any of this time. [10, 11] A teaching structure designed not only to present to students aspects from medicine but a place in which it is facilitated for them to do things, to practice, is considered to be the design of choice for a skills center. While performing the activities, students need to be coordinated and evaluated, by this receiving a feedback on them performances. In terms of educational impact, a system of teaching relaying on feedback is proved to have the highest efficiency. A design of an academic system will also benefit if it will have implemented in it the concept of "see one, do one, teach one". By this, in his education, each student will need to have a designated period in which to have the opportunity to present to his colleagues some of the maneuvers he had learned and also to coach them how to use the structure of learning that the skills center implies.

At the Faculty of Medicine, the University of Medicine and Pharmacy "Gr. T. Popa" of Iași, starting with the first semester of the year 2011-2012, for the first time in Romania,

medical students have in their curricula a mandatory practical module for training in basic nursing skills. The goal was that the students from the first year of study to achieve the minimal but also sufficient amount of skills that will allow them to properly practice in a medical ward. The idea was to implement, in the teaching system of a medical university, a design of learning relaying mostly on peers education.

Method:

In order to acquire skills, students need to have access to an appropriate documentation, the informations contained in the documentation to be properly explained to them and to have the possibility to effectively practice the learned knowledges in appropriate environments.

For the design of documentation two issues were assessed: the list of basic skills necessary to be acquired and the shape in which these knowledges to be presented.

The skills selected to be taught were thought to respond to necessities that can be structured in three main categories: ♦ skills without the acquisition of which the safety of the patients will be jeopardized; ♦ the prestige of the white coat will be jeopardized; ♦ students involvement in the performance of the most frequently realized maneuvers of medical activity will be jeopardized.

The book containing the necessary knowledges for the students should have a design allowing not only to expose informations but also to offer a tool for them work at the skills center.

The explanations provided in the book should be individualized in the body of the text, provided as photos and also as videos, in an attached DVD.

The possibility to effectively practice the learned knowledges requires completion of three organizational aspects: establishment of an appropriate skills center, constituting a network of didactic dummies and performing a good management of available human resources.

Results

16 skills were selected as a minimal portfolio feasible to be taught to first year medical students, considered to assure a sufficient background of knowledges and level of training in order to allow them access, for basic activities, in the real medical world. Figure 1

| | | |
|---|--|--|
| jeopardize the patient safety | jeopardize "white coat" prestige | jeopardize the efficiency of "bed side" university activity |
| 1. medical wash of hands 2. chest compressions 3. recovery position 4. Heimlich maneuver 5. oxygeno therapy | 6. blood pressure measurement 7. capillary glycemia measurement 8. peack expiratory flow measurement | 9. supported bed positions 10. ambulation 11. ECG 12. venipuncture 13. gluteal i.m. 14. deltoid i.m. 15. arm s.c. 16. oral therapy administration |

Figure 1 List of skills considered as minimal requirement and also sufficient to allow students to medically interact with patients

Medical hand washing with either water and soap or alcohol-based solutions, learning the medical procedures necessary for emergency situations, such as cardiorespiratory arrest, aspiration of laryngotracheal foreign bodies („choking with food”) oxygen therapy via nasal cannula have been associated, in the proposed training, to the skills needed for some basic medical activities such as: noninvasive arterial blood pressure measurement, electrocardiographic recording; capillary glycemia measurement; venous blood specimen collection; patient’s medical positioning in bed and them ambulation; administration of solid or liquid oral medication, administration of inhaled medication, measurement of peak expiratory flow; subcutaneous injection; ventrogluteal intramuscular injection or deltoid intramuscular injection.

These 16 procedures reflect in a good percentage the activity that can be found in a medical ward. It is routinely performed to drown blood specimens, record an electrocardiogram, administer medication – orally, intramuscularly on ventrogluteal or in deltoid site in case of vaccines, subcutaneous for insulin or fractioned heparins, while patients, in a ward, have to be positioned in beds or assisted in ambulation.

By reviewing the updated literature [1, 3, 6, 9], based on scientific medical evidence, for each selected procedure a specific protocol was conceived as a sequence of steps necessary to be followed, in a patient holistic approach. [8] Paragraphs describing the actions that have to be undertaken have a different format (regular fonts) from those of dialogues (bold) or explanations (smaller italic fonts). Figure 2.

| | 0 | 1 | P |
|---|---|---|-------------|
| 1. Rapid evaluation of the presence of vital signs (<i>state of consciousness, movements, speech, breathing</i>) <i>(Vital functions maintained □; cardiorespiratory arrest □)</i> Good afternoon. My name is I am the doctor/nurse who will examine you today. | | | 0 1 5 |
| 2. Wash hands ± Put on clean medical gloves (<i>only in the event of tegumentary lesions of the examiner's hands or of an infectious potential of the patient</i>) as part of standard precautions. | | | 0 1 3 |
| 3. Can you, please, tell me your name and your date of birth Thank you <i>(Conformity with the observation sheet for Name □ Date of birth □)</i> <i>Ensure a private space for examination (single bed ward, curtain, screen, etc.)</i> <i>Measurement of arterial pressure, pulse oximetry, thermometry - if there hasn't been a recent evaluation</i> <i>Arterial pressure: mmHg; SaO2: %; Temperature: °C</i> | | | 0 1 6 |
| 4. We shall register your heart electrical activity, meaning the electrocardiogram, by means of a specialised device – the electrocardiograph. <i>(explanation of the actions to be taken)</i> | | | 0 1 3 |
| 5. This is a manoeuvre which will require you to lie on your back so as to enable us to attach a connector to your chest, wrists and joints of your legs. We shall not cut or prick. The entire examination should not last more than a few minutes <i>(explain what the manoeuvre consists of)</i> | | | 0 1 3 |
| 6. It is highly recommended that your clothing allows us to easily place the registration connectors <i>(for you to be able to easily remove your clothes at the level of your chest, wrists and joints of your legs)</i> For this examination there is no need for you to avoid eating or taking your current medication. It is recommended that you go to the toilet before the examination so as to avoid potential surprises. It is very important that you are relaxed and calm during the examination <i>(explain how the patient can be of help when carrying out the measurement)</i> | | | 0 1 3 |
| 7. Your electrocardiogram is an important investigation in order to evaluate your medical condition, which is a standard of evaluation for the majority of patients. Depending on it, we shall decide on the medication that we can or cannot recommend. <i>(explain why the examination to be carried out is useful for the patient)</i> | | | 0 1 3 |
| 8. Evaluation of the patient: - check-up: thoracic hairiness (<i>hairiness removal / using the precordial electrode strip instead of mercuric ions</i>) and possible tegumentary lesions at the level of the arms or ankles (<i>burns, etc</i>) - Have you got pains in your chest? Do you feel your heart is not beating regularly? - <i>(anamnesis of symptoms (anterior thoracic pain, palpitations), blood pressure values)</i> | | | 0 1 3 |
| 9. The transportation of the patient to ECG (wheelchair – if the patient suffers from thoracic pain, dyspnoea or has locomotor problems) or of the electrocardiograph to the patient <i>(check the status of the accumulators, ground socket)</i> <i>Conditions for the ECG room: a temperature of 22 ± 2°C</i> <i>Registration of the patient in the ECG register</i> | | | 0 1 3 |
| 10. Please remove any items of clothing from your chest, wrists and ankles. <i>Expose the body parts where we shall attach the connectors (the electrodes)</i> | | | 0 1 3 |
| 11. Place the patient in dorsal decubitus <i>(any other kind of positioning shall be mentioned on the ECG)</i> <i>Adjust the bed so as to reach a level that the doctor / the nurse will find comfortable for performing their activities (usually a level as high as their waist)</i> | | | 0 1 3 |

Figure 2 Example of a protocol design (recording electrocardiogram)

Every protocol have a system of points for each constituting step: 3 or higher in case of a good performance of the step, 0 in case of a lack in execution of the step and 1 point in case of an incomplete fulfilling of the step or a good performance but not at the correct moment during the protocol. Figure 3

| | | | | |
|------------------|--|---|---|---|
| 12 | Clean the areas where the electrodes shall be placed | 0 | 1 | 3 |
| 13 | Place the electrodes by making use of electrode gel: Red + gel: right forearm, electrode on the muscle/options – which shall be mentioned, in this case, on the ECG | 0 | 1 | 3 |
| 14 | Yellow + gel: left forearm, electrode on the muscle/options – which shall be mentioned, in this case, on the ECG | 0 | 1 | 3 |
| 15 | Green + gel: left calf, electrode on the muscle/ options – which shall be mentioned, in this case, on the ECG | 0 | 1 | 3 |
| 16 | Black + gel: right calf, electrode on the muscle/ options – which shall be mentioned, in this case, on the ECG | 0 | 1 | 3 |
| 17 | Palpate the sternum in craniocaudal fashion (from top to bottom) by sliding the pulp of fingers 2, 3, and 4 along the sternum so as to identify the sternal angle – the angle of Louis | 0 | 1 | 3 |
| 18 | Laterally slide the pulp of fingers 2 and 3 along the right intercostal space corresponding to this reference point – right second intercostal space | 0 | 1 | 3 |
| 19 | Maintain finger number 2 at the level of the second intercostal space, slide in caudal fashion (downwards) with the pulp of finger number 3 and palpate across the width of the third rib right underneath it – third intercostal space | 0 | 1 | 3 |
| 20 | Use finger number 2 to reach the level of the identified space and then slide in caudal fashion (downwards) with the pulp of finger number 3 and palpate across the width of the fourth rib right underneath it – fourth intercostal space | 0 | 1 | 3 |
| 21 | Place the electrodes by making use of electrode gel: V1 + gel: right fourth intercostal space, parasternal space | 0 | 1 | 3 |
| 22 | V2 + gel: left fourth intercostal space, parasternal space | 0 | 1 | 3 |
| 23 | Maintain finger number 2 at the level of the left fourth intercostal space, slide in caudal fashion (downwards) with the pulp of finger number 3 and palpate across the width of the fourth rib – fifth intercostal space | 0 | 1 | 3 |
| 24 | Visually detect the left midclavicular line. Laterally slide fingers 2 and 3 along the fifth intercostal space until their junction with the left midclavicular line. | 0 | 1 | 3 |
| 25 | V4 + gel: left fifth intercostal space, left midclavicular line | 0 | 1 | 3 |
| 26 | V5 + gel: horizontal line of V4 – junction with the anterior axillary line | 0 | 1 | 3 |
| 27 | V6 + gel: horizontal line of V4 – junction with mid axillary line | 0 | 1 | 3 |
| 28 | V3 + gel: mid distance between V2 and V4 | 0 | 1 | 3 |
| 29 | Turn on the electrocardiograph | 0 | 1 | 3 |
| 30 | Introduce the patient's personal data in the electrocardiograph programme | 0 | 1 | 3 |
| 31 | Electrocardiographic imaging – "automatic" mode | 0 | 1 | 3 |
| 32 | ECG evaluation from the point of view of the quality of the registration: • ECG tracing – activate filters (only if the repositioning of the electrodes, the improvement of the contact, the gel, the improvement of muscle relaxation were not efficient) • Superposition of ECG directions – repeat the procedure after modifying the 1 mV = 5 mm equivalence • ECG direction with low amplitude – repeat the procedure after modifying the 1 mV = 20 mm equivalence | 0 | 1 | 3 |
| 33 | Evaluate the ECG as far as pathology related aspects are concerned. Look for: • negative waves (Q) at the beginning of QRS complexes at I, III, aVF and • repeat the ECG "manually" by asking the patient to breathe (in depth) • ultra high / ultra low level oscillation of ST • in such cases, inform the doctor while the patient is under ECG monitoring • rhythm - fast: 100-150/min if more than 150/min - inform the doctor while the patient is under ECG monitoring - slow: 40-60/min if less than 40/min - inform the doctor while the patient is under ECG monitoring - irregular - manual registration by adjusting the speed from 25 mm/sec to 10 mm/sec | 0 | 1 | 3 |
| 34 | Turn off the electrocardiograph | 0 | 1 | 3 |
| 35 | Disconnect the connectors (the electrodes) and remove the gel (by using dry tissues first and then pads dipped in alcoholic solutions so as to wipe the area) from the patient's tegument | 0 | 1 | 3 |
| 36 | "Park" electrodes without overbending the connecting wires | 0 | 1 | 3 |
| 37 | You can now put your clothes on. If the electrocardiogram is carried out at the patient's bed: One needs to ensure the patient's safety (adjust the bed at an inferior height level, lifting the lateral limiters) and to make sure he/she can easily reach his/her personal objects (e.g. mobile phone, book, crossword puzzle, etc.), the glass of water and the remote control for dialling the medical services. We are going to perform (e.g. an abdominal ultrasonously in approximately minutes. (give details about the following medical schedule and the time when the patient shall be reexamined). | 0 | 1 | 3 |
| 38 | Write down on the ECG: the blood pressure value, known pathologies, previously administered medication, consumption of coffee and tobacco | 0 | 1 | 3 |
| 39 | Present the ECG documents to the attendant / patient, ensure the patient's transportation back to the ward | 0 | 1 | 3 |
| 40 | Remove the gel (by using dry tissues and then by cleaning the area with sanitary alcohol) from the electrodes (registering connectors) | 0 | 1 | 3 |
| Total score: 200 | | 1 | | % |
| | | 2 | | % |
| | | 3 | | % |

Legend: 0 – unfulfilled criterion; 1 – partially fulfilled criterion; 3 or above – completely fulfilled criterion (according to column 5)

Figure 3 Scoring systems in an example of a protocol (recording electrocardiogram)

These 16 protocols were gathered in a book conceived to have a system of transparent sheets that can be placed over each page of the desired protocol so the points obtained at each step to be noted on the transparent using a nonpermanent marker. The sum of points can be calculated and expressed as percentage from the maximal score, feedback discussions undertaken and after completing all that, the made annotations to be erased by simply using a tissue and by this the protocol to become ready for a new evaluation. It results in an effective tool in the student effort for learning. Figure 4

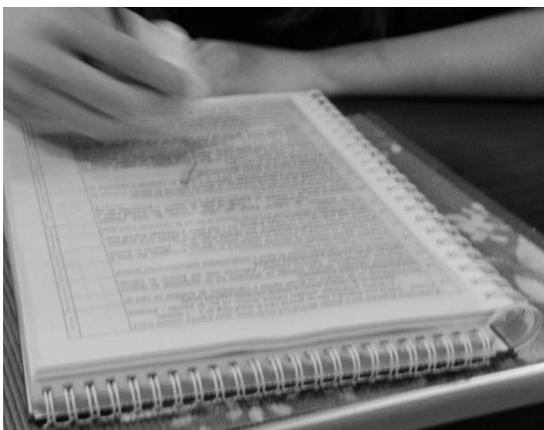


Figure 4 Design of the book, with arches that allow a system of transparent sheets that can be placed over any page of a desired protocol, annotation with a nonpermanent marker to be made and the protocol recuperated after that by simply erasing the writings that were done, using a tissue

A special section of the book, located at the end of it consist in carbonless evaluation forms used at the assessment of the student, in order to assure the objectiveness of the evaluation and a feedback of it. After performing the protocol that was selected for assessment, the evaluator signs the carbonless sheets and keeps only the first white page. By this, a copy of the evaluating remains at the student, which is capable to understand the mark, recognize the mistakes of his performance or to call them into question if it is the case. Figure 5

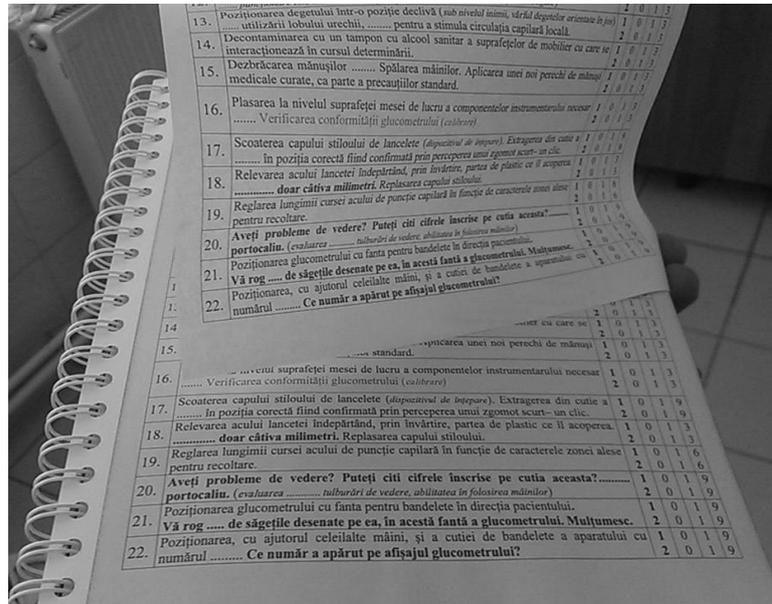


Figure 5 Carbonless evaluation forms at the final section of the book used as a tool in the activity of a skills center.

The didactic activity for skills acquisition uses a system in which teams of three students each perform the protocols from the curricula. Two hours are assigned as learning time for two protocols. Each two teams receive a presentation of two maneuvers in a period of 30 minutes (15 minutes per each protocol to be presented) and after that they practice each protocol in 45 minutes (30 min. + 45 min. + 45 min. = 2 hours). In 45 minutes, the three students composing a team, shift postures from executer of the maneuver (15 min.) to receiver of the protocol (15 min.) and to evaluator on how the protocol was performed (15 min.), using the book as a tool. The protocol is assumed to be performed in 10 – 12 minutes and the remaining 3 – 5 minutes are used for feedback. This period of time is asserted for discussions on the percentage in which the protocol was correctly executed, where points were lost, what good aspects are to be highlighted. All these three postures are considered to add specific value in the learning process in which the student is engaged. Figure 6.



Figure 6. Postures of the students during training in groups of three at the skills center: performing the protocol; receiving the protocol; evaluating how the protocol is performed

The necessary explanations are offered using a peer system of learning in which, after 21 hours of training, students are considered instructed and have to present two pre-established maneuvers to colleagues of them which already start their activity at the skill center. By doing so, they complete their learning with a component of teaching, in a didactic concept of “see one – do one – teach one”. It results in an optimal solution for providing presentations, coaching and an efficient management of human resources. For coordinators will be, by this, capable to maintain a working status for 48 + 8 students in a unit of time of two hours, at the skills center. Figure 7

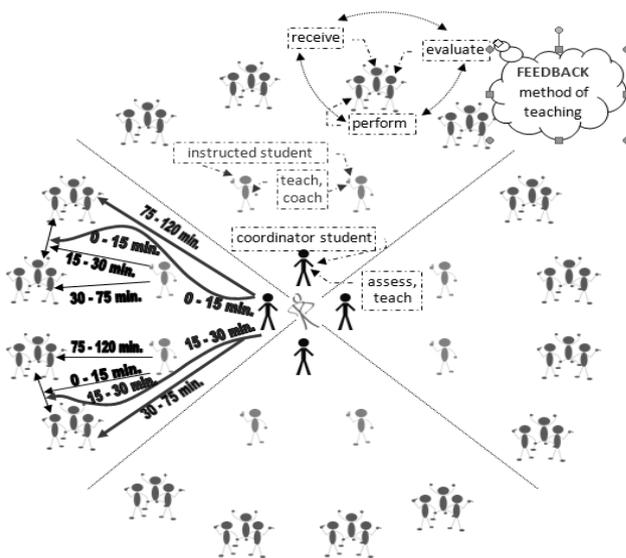


Figure 7. Schedule of students' peer activity, at Skills Center, during a 2 hours unit of time

Explanations are also provided in the book as relevant photos and as movies gathered in a DVD attached to the book. Figure 8

a red color pen were used for blood pressure measurement station. Pillows, two blankets, a belt from leather, peakflowmeters, liquid soap, paper towels, were also provided from individual efforts. A quashed electrocardiograph was minimally refurbished. A full body mannequin for cloths presentation donated by individuals was partially sectioned at under the breasts level and a box spring was inserted underneath the center of the chest to allow a 5 cm depth chest compressions training. Using a deflated ball placed in an elastic abdominal corset, the training for choking situation had became possible. Blankets allowed training for the recovery positioning. A glucometer, donated by a colleague from diabetes specialty was associated by the constant supply, by the university, with the necessary lancets and test strips. Syringes, needles, sterile gauzes were also supplied, from the beginning, by the university.

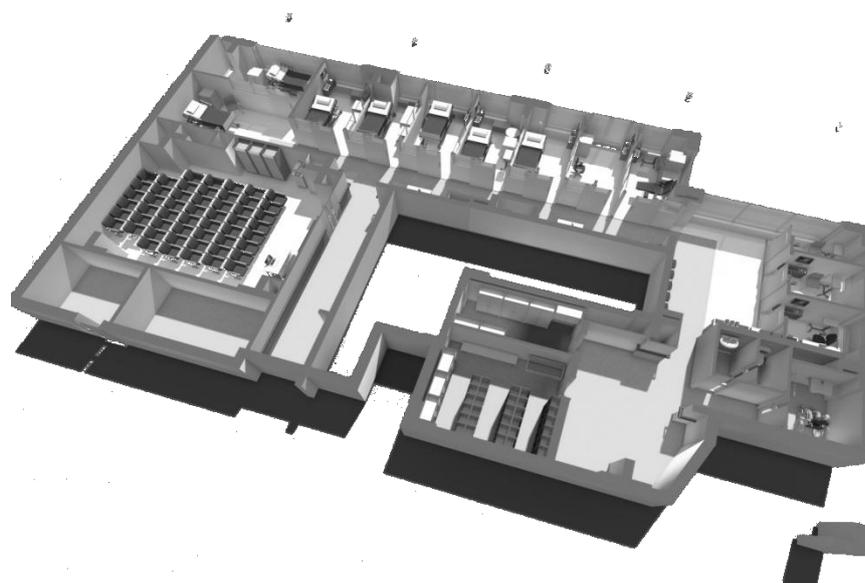


Figure 10 Overview on architectural plans of the new Skills Center building of the University of Medicine and Pharmacy “Gr. T. Popa” Iasi

Conclusions

It's a curricular model well accepted by students, conceptually based on peer's educational involvement that managed to create an efficient working academic environment using low budget and few human resources. This enthusiastic activity had convinced academic authorities to approve for 2013 an investment in a new building for the Skills Center, with all the necessary equipments. Figure 10

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