

# Curriculum design of emergency medical services program at the College of Applied Medical Sciences, King Saud bin Abdulaziz University for Health Sciences

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**Background:** The emergency medical services program at the College of Applied Medical Sciences, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Kingdom of Saudi Arabia, was adapted from the integrated problem-based learning curriculum of Flinders University, Adelaide, South Australia.

**Purpose:** The purpose of this article is to discuss the major adaptations required for adoption of the full-fledged PBL curriculum, use of sequential blocks, and multilayer alignment of the curriculum.

**Methods:** A logical model and step-by-step approach were used to design the curriculum. Several studies using Delphi methods, focus group interviews, and expert opinions were performed to identify the priority health problems; related competencies, learning objectives, and learning strategies; the web-based curriculum for delivery; student assessment; and program evaluation.

**Results:** Sixty priority health problems were identified for inclusion in different blocks of the curriculum. Identified competencies matched the satisfaction of different stakeholders, and ascertained learning objectives and strategies were aligned with the competencies. A full-fledged web-based curriculum was designed and an assessment was created that aligned with a blueprint of the objectives and the mode of delivery.

**Conclusion:** Step-by-step design ensures the multilayer alignment of the curriculum, including priority health problems, competencies, objectives, student assessment, and program evaluation.

**Keywords:** emergency medical services, problem-based learning, logical model, step-by-step approach, multilayer alignment

## Introduction

King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia (KSA), commenced its operations in May 1983. Since then, it has continued to expand, while providing services for a rapidly growing patient population in all of its catchment areas. The King Saud bin Abdulaziz University for Health Sciences includes the College of Applied Medical Sciences, a multifacility medical center. Under the university structure, the College of Applied Medical Sciences includes the colleges of medicine, academic affairs, training and development, medical and nursing education, the research center, a 900-bed tertiary care hospital, and a large emergency center (encompassing pediatric emergency care, adult emergency care, critical care, and urgent care centers) that offers primary teaching for the emergency medical services (EMS) students.<sup>1</sup>

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Over the last 3 decades, the KSA has experienced a sharp improvement in its economic status and development. Health services in particular have developed to a great extent, as witnessed by accessibility and coverage indicators, and complemented by improvement in health indicators such as mortality, morbidity, and life expectancy.<sup>2</sup> However, national health professional development has not kept pace with infrastructural growth. The percentage of Saudi nationals working in the health field is very low (25%) compared with the education and agriculture sectors. The College of Applied Medical Sciences is the first college in the KSA that aims to produce graduates of EMS, to implement a compatible program that is community oriented,<sup>3</sup> and to use teaching and learning strategies that are student centered.<sup>4</sup> These strategies foster an active role for students and provide delivery of knowledge to them in an integrated and multidisciplinary fashion.

The urgent need for an expansion in health professions education to fill the sizeable gap in health manpower in KSA is well justified. The need to train EMS professionals at the same rate of provision of infrastructural facilities is a high priority. Currently the KSA should have one ambulance for every 5000 persons and therefore 27.6 million persons would require 5520 ambulances. Each ambulance requires a staff of six trained EMS personnel, 24 hours a day, 7 days a week – that is, two per shift for three rotating shifts. As a corollary, an approximate number of 33,120 trained EMS personnel are required in the KSA. Currently there are 1550 emergency medical technicians (EMTs) spread across different regions of the KSA and 19 paramedics available only in Riyadh. National Guard Health Affairs in Riyadh has five paramedics, six intermediate EMTs, 21 basic EMTs, ten advanced life support and ten basic ambulances, and a record of transporting 300 emergency cases per month to the hospital from the community.<sup>1</sup>

The rationale for establishing the EMS program at the College of Applied Medical Sciences, King Saud bin Abdulaziz University for Health Sciences, Riyadh, KSA, is the need to address the shortage of national Saudi paramedics, in terms of both quality and quantity; to provide a state-of-the-art model for EMS education; to promote research that enhances the standards of emergency health care provided to the citizens of the KSA; and to avail the college of the educational potential in the existing health facilities in the National Guard Health Affairs for proper training of students and for high-quality research. This ensures a cost-effective and efficient utilization of national resources and provides collaboration with regional and international EMS institutions to promote globally the standards of emergency services. Evidently, the

cost-effective and efficient utilization of national resources is important not only globally but also locally: intensive care units of Saudi hospitals are a particular challenge for health managers in this respect.<sup>5</sup> The college's EMS program is based on student participation in learning through reflective exercises<sup>6</sup> and a problem-based approach, in a web-based simulation or a traditional class room,<sup>7</sup> to promote analytical thinking and engagement in lifelong learning, together with a strong focus on health research and a philosophy of defining professionalism through both qualitative and quantitative research – practical field experience. Problem-based cases (ie, patient-centered learning)<sup>8</sup> need to be tailored together with supervision, otherwise they may not serve the purpose of problem-based learning (PBL)<sup>9</sup>: the integration of students within and across years; the use of new health information technologies; a focus on clinical reasoning; assessment that emphasizes relevance, feedback, and comprehensiveness.

The EMS program has four themes: (1) basic and clinical sciences, (2) community and paramedical, (3) patient and paramedical, and (4) personal and professional development. These themes provide the framework for both the new curriculum and the assessment. The basic and clinical sciences theme, the most substantial of the four, includes the preclinical and major paraclinical and clinical disciplines, with a focus on medical emergencies; the community and paramedical theme deals with population health issues<sup>10</sup>; the patient and paramedical theme encompasses a range of clinical skills, including emergency skills, that students need to acquire; and the personal and professional development theme covers ethics, medical humanities, and professionalism.<sup>11,12</sup> There are many sources for comprehensive information regarding how to design various bachelor degree curriculums,<sup>13,14</sup> but the team approach<sup>15</sup> utilized by Flinders University, Adelaide, South Australia, is relatively unique in developing a student-based, problem-based, work-integrated, and patient-based curriculum.<sup>16</sup>

## Curriculum design, structure, and management

While the themes of the EMS program provide the framework for the whole curriculum, the central feature of the curriculum's education methods is PBL,<sup>17</sup> conducted in small groups and supported by lectures and theme sessions. Curriculum design has been based on sound national and international standards and research in teaching and learning. Curriculum design draws on the principles of symbiosis between clinical learning and the broad health care system, which includes influences such as the social, psychological, and

epidemiological context of health, and the political, ethical, and economic environment. There is a holistic approach to the role a paramedic plays in the broad health care system.<sup>18</sup> Furthermore, in the broad health care system an emphasis is placed on local, national, and international clinical practice guidelines – these ensure that clinical competence of students is based on the most current evidence-based data available. Furthermore, students need to be exposed to the practical field early in the curriculum, which aims for students to acquire generic skills of communication in the emergency setting together with systematic history taking and complete physical examination skills.<sup>12,19</sup>

With regard to a model of clinical reasoning, the aim is to offer a model that will allow students to develop sophisticated reasoning skills applicable in clinical environments.<sup>19,20</sup> Utilizing information health technology to support the learning process means presenting a “trigger” in a multimedia format. Starting with the problem trigger, the reasoning model then determines the way in which resources are presented to the students. During tutorial sessions, individual students identify the cues, formulate the problem, generate and organize hypotheses, and make a differential diagnosis. Furthermore, the students plan inquiry, seeking patient and epidemiological data to distinguish between hypotheses and reformulate the problem in order to identify learning issues to guide individual study. During tutorial sessions, the student may reach a diagnostic decision and research questions feedback on the problem.<sup>21</sup>

Problems and clinical scenarios were designed to introduce important medical emergency issues across all four themes of the EMS program. A condition or disease state could be submitted if it met one or more of the following criteria: common in terms of incidence/prevalence or as a cause of death; life-threatening; illustrative of an important clinical or scientific principle; and problem covering a spectrum of illness that is related to EMS across all age groups, in both urban and rural settings, and encompassing various ethnic groups of the Saudi community. In the real-life emergency setting every presenting case is not clear, and clinical reasoning may be helped by script concordance if a problem scenario is uncertain.<sup>22</sup>

## Curricular phases of the EMS program

The EMS program has two curricular phases. Phase I covers one semester and includes 2 preprofessional years. Phase II comprises semesters 1–4 of 2 professional years, like that of the Flinders University curriculum. The paramedic curriculum follows a logical progression from basic emergency care in the first semester, through advanced concepts of pathophysiology of major body systems coupled with advanced life support

practiced in the second and third semesters. Psychology and mental illness management form a significant portion of the third semester. The fourth semester focuses on building the skills and knowledge into a biopsychosocial, holistic approach to case management, incorporating leadership, safety, clinical assessments, and administration of therapies. Throughout this progression through the semesters, there is an emphasis on learning practical skills and their application in medical emergencies. Learning on campus is supported by ambulance clinical placements and a limited number of placements within other health care facilities.

Sixty priority health problems were identified for inclusion as sequential blocks of the curriculum in Phase II. These blocks vary in length from 4 to 10 weeks, with a problem presented each week. Up to eight key issues or learning topics are identified within each block, with the topics expected to arise naturally during the week as the basis for self-directed learning. These major issues are addressed in lectures and theme sessions that include practical sessions, clinical tutorials, evidence-based medicine exercises, and class discussions. In the final semester the students have 10 weeks of hospital rotation, which aims to obtain experience in the major clinical fields of the pediatric intensive care unit, pediatric emergency care, the adult intensive care unit, adult emergency care, trauma emergency care, and the obstetric unit. Students also have 10 weeks of the aforementioned applied paramedic practice, which aims to provide the students with an integration of all the paramedic-related skills, knowledge, and attitudes, in order to enable them to graduate with confidence and with a thorough grounding in paramedic practice in preparation for their internship.

## Objectives of the project

The two objectives were (1) adaptation and modification of the EMS program from Flinders University to fit local regulations and university strategies and (2) to provide a state-of-the-art model for EMS education that is student centered and community oriented. More details of the Flinders University curriculum for bachelor of health sciences degrees for paramedics are available online.<sup>16</sup>

## Method

Five studies, which will be described briefly, were conducted (Table 1). The aim of the first study (study 1) was to identify the common emergency problems. Study 1 involved 20 participants: ten paramedics (male = 8; female = 2), all of whom held a bachelor degree from the United States and had over 7 years' experience, and ten male emergency

**Table 1** Brief summary of the five studies

Study	Aims	Method	Participants (n)
1	To identify the common emergency problems	Modified Delphi	Paramedics (n = 10) and emergency consultants (n = 10)
2	To prioritize the health problems	A cross-sectional survey using evaluation grid suggested by MacDonald et al <sup>24</sup>	Emergency consultants (n = 25), paramedics (n = 5), EMTs (n = 10), and medical educationists (n = 5)
3	To identify competencies, learning objectives and strategies	Modified Delphi	Paramedics (n = 10) and emergency consultants (n = 10)
4	To reach a consensus on the EMS program, its mission, vision, and values	Focus group discussions	Professors of medical education (n = 2), paramedics (n = 2), and project designers (n = 3)
5	To work on designing problems and weekly learning objectives and to design CVS and RS blocks	Expert group discussions	Paramedics (n = 5), professors (n = 2), ER consultants (n = 2), and block designers (n = 2)

**Abbreviations:** CVS, cardiovascular system; EMS, emergency medical services; EMT, emergency medical technician; ER, emergency room; RS, respiratory system.

consultants, including one pediatric emergency consultant, all of whom had more than 5 years' experience. Modified Delphi method in two rounds<sup>23</sup> was used with all participants. The first round was used to list the most common problems (cases) the participants encounter in emergency services in the cardiovascular system (CVS) and in the respiratory system (RS). The second round involved reaching consensus on the list of most common problems.

The aim of the second study (study 2) was to prioritize the health problems. The study design was cross-sectional. The breakdown of participants for study 2 was as follows: 25 emergency consultants; five paramedics; ten EMTs; and five medical educationists. The indicators suggested by McDonald et al<sup>24</sup> were used for rating the problems: prevalence; 1-year case fatality rate; level of remaining quality of life; urgency of the illness condition; prevention (availability and applicability); diagnostic process (accuracy and applicability); intervention in established cases (efficacy); and educational impact (Appendix 1).

The aims of the third study (study 3) were to identify competencies, learning objectives, and learning strategies. The design was the Modified Delphi method in two rounds<sup>25</sup> and the participants were the same participants as in study 1. In the first round, the participants were asked to list statements regarding competencies, learning objectives, and learning strategies. In the second round, each participant was requested to rate each statement on a five-point Likert scale according to the importance of the statement after analysis. A statement with a mean score less than 3 was excluded and a final list of competencies, learning objectives, and learning strategies was formulated.

The fourth study (study 4) aimed to reach a consensus on the EMS program and its mission, vision, and values. The adopted design was focus group discussion, which

comprised two professors of medical education with more than 20 years' experience in teaching, two paramedics, and three project designers.

The aims of the fifth study (study 5) were to work on designing problems and weekly learning objectives and to design CVS and RS blocks. The participants comprised five paramedics, two professors, two ER consultants, and two block designers. In the first round (step 1), a workshop was organized and the participants, divided into two groups, discussed designing problems and learning objectives: one group was responsible for deciding about the learning objectives of a specific week and the other group was asked to design problems. To achieve the CVS and RS block design objective, an expert focus group (step 2) comprising the same participants as for step 1 discussed block designing. The designed problems were switched between the two groups to finally reaching a consensus.

The integrated problem-based learning curriculum of Flinders University<sup>16</sup> was selected for adaptation to the Saudi context, and the following exercises were performed for the purposes of adoption, synchronization, adaptation, modification, implementation, and evaluation. The details of the adoption process and, especially, of the justifications for this are given in the Results section. The author would like to emphasize that there are no set definitions for the terms "modification" and "adaptation". As a result, these terms are often used imprecisely and interchangeably. Generally, modifications and adaptations refer to individualized curriculum changes that reduce the difficulty and size of a student's workload. However, accommodations usually refer to tools and techniques that help students keep up with a standard workload identical to that of their peers. In other words, modifications and adaptations change what a student

is expected to learn while accommodations change how a student learns. The author uses both terms adaptation and modification throughout this article.

## Results

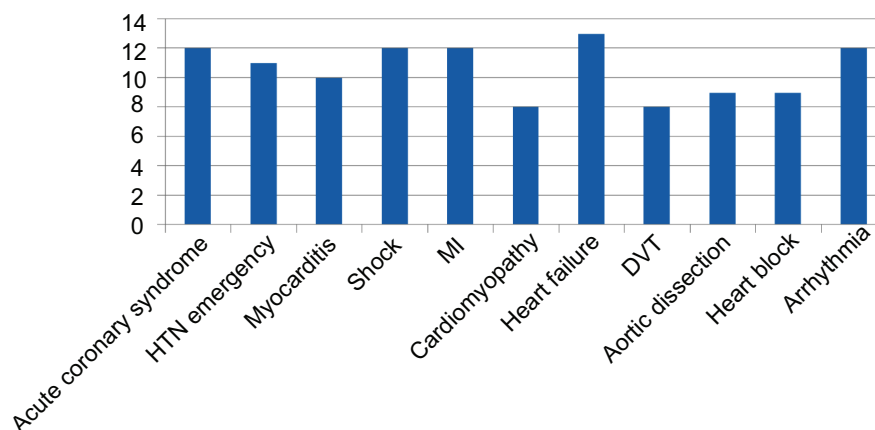
The identification of emergency health and prioritized health problems was used to modify the curriculum, and most relevant emergencies were retained in the final curriculum. Using a modified Delphi method,<sup>23</sup> the expert group identified the following cardiovascular problems (Figure 1), given in the order reflected by their scores (highest to lowest on a scale from 0 to 14 [where 0 is the lowest magnitude and 14 indicates the highest magnitude]): heart failure, acute coronary syndrome, shock, myocardial infarction, arrhythmia, hypertension emergency, myocarditis, aortic dissection, heart block, cardiomyopathy, and deep vein thrombosis. The respiratory problems (Figure 2), also given in order of score (highest to lowest on scale 0–14), were as follows: acute respiratory syndrome, bronchial asthma, foreign body aspiration, chronic obstructive pulmonary disease, acute respiratory failure, pulmonary embolism, pneumonia, bronchiolitis, and bronchitis.

Using a modified Delphi method,<sup>23</sup> the expert group identified the following competencies as reflected by their scores (highest to lowest, on a scale from 0 to 6) (Figure 3): safety and communication; critical thinking and assessment; scene management, clinical skills, professionalism, and team approach; and teaching skills and research.

Expert group formulated vision statement that EMS program<sup>16</sup> must be recognized as an excellence degree course that utilizes advanced concepts of best evidence-based medical emergency services education to attract the best students and faculty. The mission of the EMS center of excellence is

to provide outstanding prehospital medical education that covers not only paramedic-specific learning but also learning related to the political, administrative, social, epidemiological, and medicolegal environment, which is applicable to the entire Saudi health care system. The identified values were (1) faculty, staff, and students who demonstrate the highest ethical standards; (2) faculty, staff, and students who demonstrate integrity; (3) faculty, staff, and students who demonstrate professionalism throughout their teaching and practice careers; (4) relevance, in terms of the faculty, staff, and students being responsive to the needs of the community through addressing priority emergency health problems; (5) respect and cultural sensitivity, ie., faculty, staff, and students treat others with respect and dignity, honoring community culture and traditions; and (6) high-quality leadership and teamwork that faculty and students teach and learn, as well as high-quality education models with leadership behavior and performance and a spirit of sharing and teamwork.

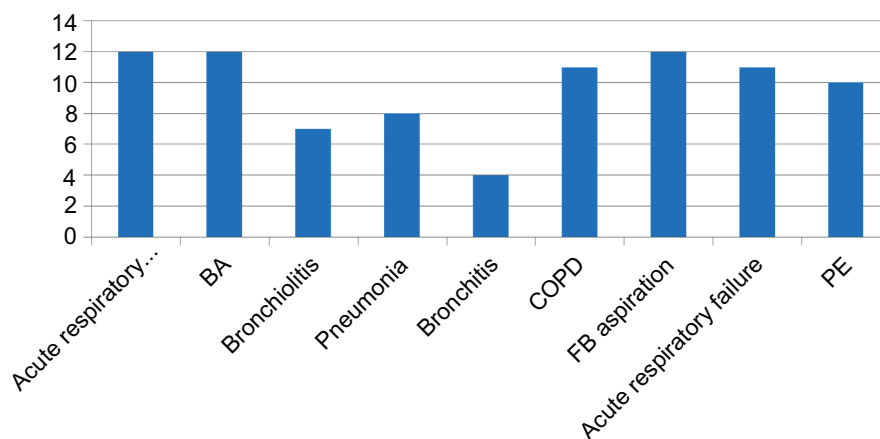
With regard to the learning objectives and strategies (Figure 4), the expert panel tailored five objectives of the Flinders University EMS program<sup>16</sup> by scoring objectives from least important (scoring 1) to most important (scoring 5). The two standing objectives were (1) to develop competence at patient assessment, generation of diagnoses, administration of therapy, and evaluation of care provided (scored as 5) and (2) to demonstrate proficiency in basic life support, advanced cardiac life support, pediatric advanced life support, and advanced trauma life support (scored as 5). The other three objectives identified were as follows: students must (1) demonstrate understanding of anatomical and physiological organs and system functions (scored as 4), (2) demonstrate understanding of pathophysiology of commonly



**Figure 1** Cardiovascular problem magnitude.

**Abbreviations:** DVT, deep vein thrombosis; HTN, hypertensive; MI, myocardial infarction.





**Figure 2** Respiratory problem magnitude.

**Abbreviations:** BA, bronchial asthma; COPD, chronic obstructive pulmonary disease; FB, foreign body; PE, pulmonary embolism.

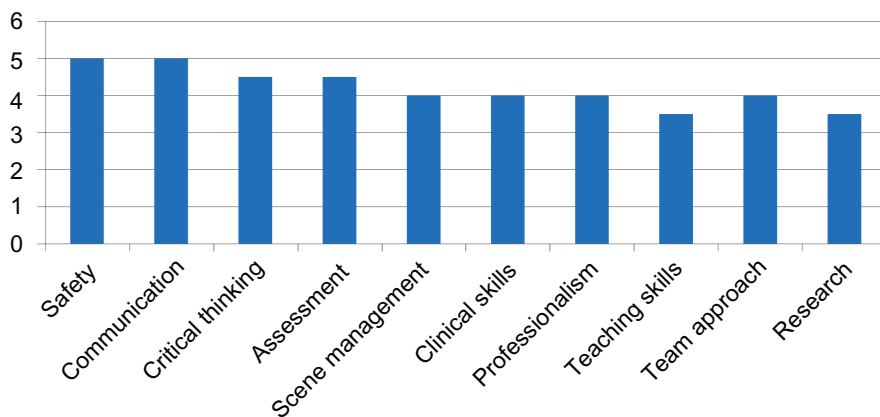
encountered medical and surgical emergencies (scored as 3), and (3) advise and offer health education to patients and their families (scored as 3). The identified learning strategies, in decreasing order of score, were as follows: problem-based learning, practice, simulation and feedback (all scored at 5); procedural skills (scored at 4.5); lecture, self-directed learning, research, curriculum-based assessment and outcome based (all scored at 4); and seminar and assignment (both scored at 3).

## Curriculum adoption

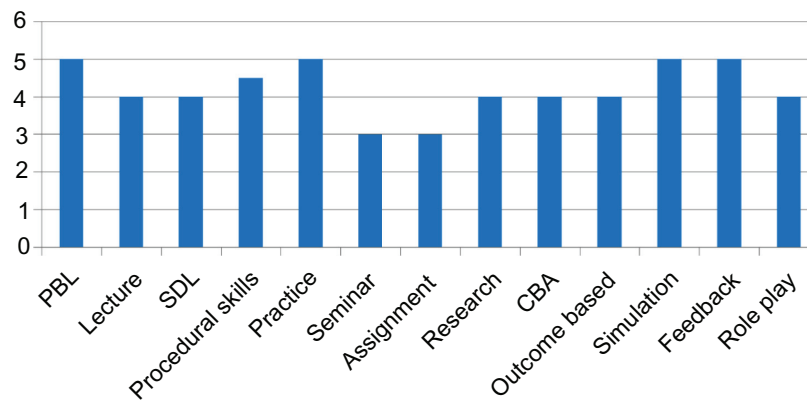
The details of curriculum adoption and the various other related stages, including initial proposed curriculum, synchronization, adaptation, implementation, assessment, and evaluations<sup>24-27</sup> are demonstrated in Tables 2–6. The various topics finally selected, objectives of studies 1 and 2 are also presented in the proposed initial and the final curriculum for the EMS program. The modifications made to the Flinders University curriculum are outlined as follows.

In the first semester, Paramedic Practice 1 and communications skills cover the basics of primary and secondary surveys of resuscitation, patient examination and history taking, making judgements of life threats, communicating in the health care setting, and providing medical handover and documentation. These foundation skills tend to be delivered early. Amalgamating Paramedic Practice 1 and communications has a logical synergy, as communication skills are requisite to effective clinical skills. Paramedic Practice 3, with its medical emergency theme, should be the next block. It contains some important concepts of physiology, which will be useful to the subsequent Paramedic Practice 2. Paramedic Practice 2 falls comfortably at the end of this semester, with a focus on trauma management.

The second semester includes the pathophysiology of the CVS. It is logical to run this topic in the second semester, as advanced concepts of managing shock, acute myocardial infarction, and heart failure are covered.



**Figure 3** Identified competencies.



**Figure 4** Learning objectives and strategies.

**Abbreviations:** CBA, curriculum-based assessment; PBL, problem-based learning; SDL, self-directed learning.

Skills in intravenous cannulation, fluid resuscitation, and electrocardiogram interpretation can be applied in subsequent pathophysiology topics. Because of close synergies between the CVS and RS, pathophysiology of the RS should be presented next. Applied pharmacology could then be taken. This topic does have some reliance on knowledge from the previous pathophysiology topics and should provide an enhanced understanding of the pathophysiology from a clinical pharmacological perspective.

The third semester includes pathophysiology of the nervous system (NS) – a demanding topic with a wide range of material covered. Mental health and mental illness is the next obvious topic, which has some important linkage with the pathophysiology of the NS. It was scheduled after pathophysiology of the NS, followed by pathophysiology of other body systems. The third semester has a focus on a

variety of body systems and also introduces more advanced concepts of physical examination and clinical assessment. This topic provides a good platform to move into Applied Paramedic Practice, which lies in the fourth semester.

The fourth semester includes health research, a full and demanding topic with a practical focus on research methodologies. In order to perform well in this topic, students should be well acquainted with academic life; hence the topic is scheduled in the final semester. Professional studies prepare students with attitudes, knowledge, and responsibilities for moving into the profession and hence it is appropriate in the final semester. Applied Paramedic Practice takes the students on a journey through application of all the previous learning and provides the student with opportunities to develop different competencies. It prepares them for clinical work and hence should be the final topic taken (Tables 2 and 3).

**Table 2** Semesters by block design

Semester	Code and number	Block	Weeks	Credit hours	Lecture hours/week	Other sessions (hours/week)
1	EMMS 311	Paramedic practice 1 and communication for EMTs (combined)	6	6	10	2
	EMMS 312	Paramedic practice 2	5	5	5	7
	EMMS 313	Paramedic practice 3	5	5	5	5
2	EMMS 314	Pathophysiology of the CVS	6	6	4	9
	EMMS 315	Pathophysiology of the RS	6	6	4	9
	EMMS 316	Applied pharmacology	4	4	2	5
3	EMMS 321	Practical field 1	N/A	2	N/A	N/A
	EMMS 417	Pathophysiology of the NS	6	5	4	9
	EMMS 418	Mental health and mental illness	4	3	1	
	EMMS 419	Pathophysiology of body systems	6	5	4	9
	EMMS 422	Practical field 2	N/A	4	N/A	N/A
4	EMMS 420	Hospital rotation	10	7	N/A	10
	EMMS 401	Professional studies	2	2	1	7
	EMMS 423	Applied paramedic practice	10	7	N/A	14

**Abbreviations:** CVS, cardiovascular system; EMT, emergency medical technician; NA, not applicable; NS, nervous system; RS, respiratory system.

**Table 3** Curriculum modifications

Day	Date (2009)	Time	Activity
Saturday	October 17	1000–1200 1300–1600	Lecture: Introduction to OHS&W, parts 1 and 2 Lecture: Manual handling, parts 1, 2, and 3
Sunday	October 18	1000–1200 1300–1600	Lecture: Shock, parts 1 and 2 Lecture: Hemorrhage control practical, parts 1 and 2
Monday	October 19	1000–1200 1300–1600	Lecture: Basic physiological concepts 1, parts 1 and 2 Practical sessions
Tuesday	October 20	1000–1200	Lecture: Academic skills 1
Wednesday	October 21	1000–1200	Lecture: Academic skills 2
Saturday	October 24	1000–1200	Lecture: Infection control, parts 1 and 2
Sunday	October 25	1000–1200 1300–1600	Lecture: Head, facial, neck, parts 1 and 2 Lecture: The head injured patient, parts 1, 2, and 3
Monday	October 26	1000–1200 1300–1600	Lecture: Basic physiological concepts 2, parts 1 and 2 Practical sessions
Tuesday	October 27	1000–1200	Lecture: PBL diabetes, parts 1 and 2
Wednesday	October 28	1000–1200	Lecture: PBL autonomic nervous system, parts 1 and 2

**Abbreviations:** OHS&W, occupational health, safety, and welfare; PBL, problem-based learning.

## Modifications

The main modifications in the curriculum included the following items; learning objectives, weekly specific objectives, aligned assessment, weekly problems, learning topics, mode of teaching in terms of lectures, PBL, practical fields, simulation, self-directed learning, basic and clinical sciences,

patient and paramedics and community and paramedics, and, finally, personal and professional themes.

## Discussion

Curriculum development and evaluation is important because of the huge impact the curriculum has on student learning

**Table 4** Adopting stage

Flinders curriculum		KSAU-HS curriculum		Sem
HLTH 1201	Paramedic practice 1	Paramedic practice 1		1
HLTH 1304	Communication for health practitioners	Communications for EMT's		
HLTH 1302	Introduction to the health professions	Paramedic practice 2		
HLTH 1004	Human bioscience	Paramedic practice 3		2
HLTH 1202	Paramedic practice 2	Social determinates of health		
HLTH 1203	Paramedic practice 3	Pathophysiology of the cardiovascular system		
HLTH 1204	Contemporary lifestyle management for health care professionals	Pathophysiology of the respiratory system		
HLTH 1303	Reforming health care: policy, politics and the profession	Clinical methods 1		3
HLTH 2003	Society and health: sociology and epidemiology	Pathophysiology of the nervous system		
HLTH 2202	Pathophysiology of the cardiovascular system	Applied pharmacology		
HLTH 2203	Pathophysiology of the respiratory system	Research methods		4
New topic	Clinical methods 1	Clinical methods 2		
HLTH 2201	Pathophysiology of the nervous system	Patient assessment and clinical reasoning		4
NURS 2108	Mental illness, alcohol, tobacco and other drugs	Pathophysiology of body systems		
HLTH 2002	Health: a psychological perspective	Applied paramedic practice		
New topic	Clinical methods 2	Professionalism and health service management		
New topic	Patient assessment and clinical reasoning			
HLTH 3001	Health research 1			
HLTH 3207	Emergency law and ethics			
HLTH 3202	Pathophysiology of body systems			
HLTH 3204	Applied pharmacology			
HLTH 3201	Paramedic: professional issues			
HLTH 3206	Applied paramedic practice			
New topic	Health research 2			

**Abbreviations:** EMT, emergency medical technician; KSAU-HS, King Saud bin Abdulaziz University for Health Sciences; Sem, semester.



**Table 5** Initial proposed curriculum

Semester	Topic	Source material
1	Paramedic practice A: medical	HLTH 1201: Paramedic practice 1 HLTH 1203: Paramedic practice 3
	Paramedic practice B: trauma	HLTH 1202: Paramedic practice 2
	Communication for health practitioners	HLTH 1304: Communication for health practitioners
2	Applied pharmacology	HLTH 3204: Applied pharmacology
	Pathophysiology of the CVS	HLTH 2202: Pathophysiology of the CVS
3	Pathophysiology of the RS	HLTH 2203: Pathophysiology of the RS
	Pathophysiology of the NS	HLTH 2201: Pathophysiology of the NS
	Health and illness	HLTH 2002: Health: a psychological perspective HLTH 2003: Society and health: sociology and epidemiology
4	Paramedic: professional issues	HLTH 3201: Paramedic: professional issues
	Health research: epidemiology and methodologies	HLTH 2003: Society and health: sociology and epidemiology HLTH 3001: Health and research I
	Applied paramedic practice Applied clinical assessment and decision	HLTH 3206: Applied paramedic practice HLTH 3202: Pathophysiology of body systems

**Abbreviations:** CVS, cardiovascular system; NS, nervous system; RS, respiratory system.

and on the quality of the health services that students will ultimately deliver in the field. Content that is targeted and well sequenced ensures that students receive integrated, coherent learning experiences that contribute towards their personal, academic, and professional learning and development. The design and development of curriculums for degree courses and major and minor sequences of such courses focus on how the educational experience contributes to students' development of the graduate qualities. These qualities provide a key reference point for the curriculum development process. They must be related to the conceptual frameworks, language, and practices of the student's field

of study through quality learning experiences. This is the strength of the current adoption of the Flinders curriculum for EMS.

Key elements and relationships in curriculums include, at the heart of the curriculum, faculty staff and students. The relationships between them are shaped by the educational aims of courses, curriculum management principles, implementation steps, sequences and topics, intended learning outcomes for students, feedback materials from students, assessment, content, learning interactions, and the connections among these elements.<sup>28-30</sup> Similarly, the final adopted curriculum reflects all of these elements: the input of

**Table 6** Synchronization

Semester	Topic	Source material
1	Paramedic practice A: medical	HLTH 1201: Paramedic practice 1 HLTH 1203: Paramedic practice 3
	Paramedic practice B: trauma	HLTH 1202: Paramedic practice 2
	Communication for health practitioners	HLTH 1304: Communication for health practitioners*
2	Applied pharmacology	HLTH 3204: Applied pharmacology
	Pathophysiology of the CVS	HLTH 2202: Pathophysiology of the CVS
3	Pathophysiology of the RS	HLTH 2203: Pathophysiology of the RS
	Pathophysiology of the NS	HLTH 2201: Pathophysiology of the NS
	Health and illness	HLTH 2002: Health: a psychological perspective HLTH 2003: Society and health: sociology and epidemiology
4	Paramedic: professional issues	HLTH 3201: Paramedic: professional issues
	Health research: epidemiology and methodologies	HLTH 3001: Health and research I
	Applied paramedic practice Applied clinical assessment and decision	HLTH 3206: Applied paramedic practice HLTH 3202: Pathophysiology of body systems

**Note:** \*This replaces human bioscience because the students already take this block for 8 weeks in the foundation years.

**Abbreviations:** CVS, cardiovascular system; NS, nervous system; RS, respiratory system.

faculty staff and students into the overall frame of the EMS curriculum means their chosen contextual emergency medical problems, prioritized medical problems of the CVS and the RS, and basic sciences and practical field exercises are included, as well as several competencies and teaching strategies chosen on a consensus basis in various workshops and related studies guided by highly experienced faculty staff.

Blocks and their timelines were organized in such a way that knowledge of preceding blocks was essential in order for students to move to the next block and its complete understanding. The unproblematic transition and diversification, two qualities of curriculum design and development, need to be shown to students during the learning processes.<sup>16</sup> Students' transition to university should be an easy and lively experience that would depend on curriculum components facilitating that process and dynamic step. For this purpose attitudes, aptitudes, and cultural qualities of students should be considered as part of curriculum development, helping in learning, understanding, and encouraging positive interactions during implementation of courses.<sup>16,31</sup> The adopted EMS curriculum is modeled on the work-integrated learning also used in nursing education<sup>32</sup> and as supported by the UK organization JISC; this work-integrated learning encourages digital technology in designing curriculums.<sup>33</sup> Intended learning outcomes frame and shape the detail and alignment of assessment learning interactions and content,<sup>34</sup> as also exercised in developing the EMS curriculum. Intended learning outcomes describe the characteristics that a student should be able to show on successful completion of a course. Assessment gauges the extent of students' achievement of the intended outcomes; learning interactions and content should help to build towards students' achievement of those outcomes. In related development, novel curriculums supported by computerized human patient simulators are implemented for improving the performance of the medical emergency team.<sup>35</sup> Digital technology is globally revolutionizing the designing of medical education curriculums.<sup>34</sup>

## Conclusion

A step-by-step curriculum design ensures the multilayer alignment of the curriculum. The layers include priority health problems, competencies, themes and objectives, block design and learning methods, implementation, diversification and transition, student assessment and feedback, and program evaluation. There is a need to "localize/adopt" curriculums to specific regions (taking into account health priority areas and cultural norms and practices) and not just to implement existing curriculums from other universities.

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The author reports no conflicts of interest in this work.

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## Appendix

### Appendix I The health problems evaluation grid suggested by MacDonald et al<sup>24</sup>

#### Prevalence

- 2 Condition affecting 3% or more of the population
- 1 Condition has a prevalence of <3%
- 0 Condition has a prevalence of <0.03%

#### One-year case fatality rate

- 2 3%
- 1 <3%
- 0 <0.03%

#### Level of remaining quality of life

- 2 <30%
- 1 30%–70%
- 0 ≥70%

#### Urgency of the illness condition

- 2 Intervention is required within 6 hours
- 1 Intervention may be postponed for up to 48 hours
- 0 Intervention may be postponed for over 48 hours

#### Prevention: availability and applicability

- 2 A measure is both available and applicable
- 1 A measure is available
- 0 No prevention available

#### Diagnostic process: accuracy and applicability

- 2 Satisfactory accuracy and applicability
- 1 Accurate but not applicable
- 0 Neither accurate nor applicable

#### Intervention in established cases: efficacy

- 2 Both efficacious and applicable
- 1 An efficacious intervention
- 0 A non-efficacious intervention

#### Educational impact

- 2 High impact involving multiple disciplines and generate multiple objectives
- 1 Moderate impact involving two or three disciplines with few objectives
- 0 One discipline and one objective

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