Policy Brief

Strengthening Emergency Medical Services in Lebanon

K2P Policy Briefs bring together global research evidence, local evidence and context-specific knowledge to inform deliberations about health policies and programmes. It is prepared by synthesising and contextualizing the best available evidence about the problem and viable solutions through the involvement of content experts, policymakers and stakeholders.

Policy Brief

+ Included

Description of a health system problem

Viable options for addressing this problem

Strategies for implementing these options

× Not Included

Does not make **recommendations**

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K2P Policy Brief

Strengthening Emergency Medical Services in Lebanon

الصليب الأحمر اللبناني Croix Rouge Libanaise
REPUBLIC OF LEBANON
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The problem

In Lebanon, Emergency Medical Services (EMS) are underutilized and somewhat fragmented and EMS agencies lack adequate resource management including: human, equipment, infrastructure and financial resources. System related challenges at multiple levels are narrowing EMS agencies' effectiveness, efficiency and consequently the continuum of care. As reported by a tertiary hospital in Beirut, EMS agencies transport only 15.2% of patients with 55.2% of stroke patients arriving late to the Emergency Department (El Sayed et al., 2014a). The out-of-hospital survival rate of cardiac arrest in Beirut is low (around 5%) reflecting poor quality service (El Sayed et al., 2014a).These and other system level challenges are leading to low out of hospital survival rates. Use of EMS services varies widely between regions and utilization is low (23.3%) across all regions reflecting problems in underutilization (El Sayed, 2016). Limited EMS care is due to problems at the governance, financing and delivery arrangements.

Underlying factors

- Absence of a governing body operating under the MoPH that leads, oversees, plans, develops policies and regulates EMS system in Lebanon.
- National standard operating procedures or pre-hospital medical treatment protocols, as well as the standard for certification and training, are missing.
- Financial stability of EMS agencies is fragile, financing allocations are little and/or inefficient.
- Pre-hospital and hospital-based components of Lebanon health system operate separately without adequate coordination.
- Day-to-day medical oversights in terms of quality management and performance improvement on EMS activities that are usually performed by physicians for medical control are lacking.
- Community awareness is crucial for an effective EMS system, yet still lacking in Lebanon.

What do we know about three elements of an approach to addressing the problem?

Element 1› Ensure standardization of pre-hospital medical procedures, training, and education.

- Four systematic reviews found that the development of guidelines and indicators for EMS services enhances the quality of care and reduces morbidity and mortality.
- One systematic review on the impact of accreditation programs on the quality of healthcare services indicated that those programs should be supported as a tool to improve the quality of healthcare services.
- A meta-analysis found that it is important to create a national governing body that overlooks pre-hospital services.
- A systematic review identified common effective initiatives to improve trauma services and EMS in Low and Middle-Income Countries, including the provision of standardized training and formalized certification processes for prehospital care providers.
- One systematic review found that quality assurance in health professional education incorporates educational standards and accreditation processes for education providers.

Element 2› Improve the delivery system by enhancing the emergency services and technical abilities of emergency professionals.

- Three systematic reviews found that BLS is effective in pre-hospital setting and reduces morbidity and mortality while ensuring a greater survival rate.
- A systematic review proved that the Advanced Life Support (ALS) used for specific cases can be done in later stages, but the focus should be on the BLS.
- According to seven systematic reviews and three meta-analyses, ALS is effective in early diagnosis, survival, and transportation, especially in rural areas.
- Six systematic reviews pointed out limited evidence on the effectiveness of triage during patient transportation.
- A medium quality review provided good evidence on the benefits of pre-hospital services performed by critical care paramedics in severe traumatic brain injury cases.

- Four systematic reviews and four meta-analyses showed that the use of technology-enhanced simulation training improves the CPR knowledge and skills for the paramedic team and also moderately improves patient outcomes.
- Five systematic review and three studies found training of layperson to be effective in the provision of BLS care and in increasing bystander rate, especially in areas with limited resources.

Element 3› Increase the financing of EMS through various methodologies.

- The expense of EMS systems is determined by equipment acquisition and maintenance, communications systems, personnel and their education, medical direction, licensing and regulation activities.
- A study found that an effective policy for EMS financial reform can start from designing methods of cost recovery and community financing through appropriate user fees and revolving fund at all levels at first, then move to devising cost sharing methods between the federal, state, and local governments, seeking for private sector involvement and funding, and finally collaborating with the WHO, World Bank and USAID for the technical and financial support.
- Two studies found that P4P is effective in incentivizing EMS agencies and paramedics, it was found to improve the performance and data collection methods of agencies.
- Seven studies mentioned that general taxation is used in countries where EMS is public and provided by the government.
- Two systematic reviews and two studies found community loans to be effective specifically in Africa.

What implementation considerations need to be kept in mind?

- Patients are not aware how to activate the EMS system in case of emergency.
- Lay people lack knowledge and skills in managing emergency situations generally and injured victims particularly.
- Training unselected laypersons in CPR/defibrillation is costly.

- Professionals will resist the implementation of a new accreditation system due to lack of time, knowledge and financial incentives as well as a reluctance to change practice.
- Financial stresses and mismatching of resources may be encountered when enhancing the EMS system, such as when improving or implementing BLS or ALS.
- Implementing national standards, educational and training standards require training and resources which are both timely and costly.
- Comprehensive statistical evaluations with digital databases and registries are limited by resources, technology, and expertise for EMS.
- Adopting international standards in Lebanon is complicated and challenging due to the different contexts each country has.
- There is no committee to audit and monitor the implementation of standards.

الرسائل الأساسية

تعريف المشكلة

تعاني خدمات الطوارئ الطبية في لبنان من عدة تحديات، لعلّ أبرزها ضعف معدلات الاستخدام، والتشتت وضعف أو غياب التسنيق، والافتقاد إلى الإدارة المناسبة للموارد، بما في ذلك الموارد البشرية والمعدات والبنية التحتية والموارد المالية. وتعتبر التحديات على مستوى النظام الصحي بمختلف مستوياته، من أبرز العوامل التي تحدّ من فعالية وكفاءة وكالات خدمات الطوارئ الطبية، وبالتالي تحدّ من استمرارية الرعاية. وبحسب إحصائيات إحدى المستشفيات الكبرى في بيروت، فإنّ خدمات الطوارئ الطبية تنقل فقط حوالي 15.2% من المرضى، كما أنّ 55.2% من المرضى الذين يعانون من سكتة دماغية يصلون متأخرين إلى طوارئ المستشفى (*El Sayed et al. 2014a*). وتقدّر نسبة البقاء على قيد الحياة في أوساط من يعانون من سكتة قلبية في العاصمة بيروت بحوالي 5% وهي نسبة منخفضة مما يعكس ضعف جودة الخدمة (*El Sayed et al. 2014a*). ويرجع انخفاض معدلات البقاء على قيد الحياة خارج بيئة الاستشفاء إلى مثل هذه التحديات وغيرها على مستوى النظام الصحي، حيث تشهد خدمات الطوارئ الطبية ضعفاً في معدلات الاستخدام، وإن كانت تختلف من منطقة إلى أخرى بصورة شاسعة. لكنّ المعدل العام لجميع المناطق يبقى منخفضاً بحوالي 23.3% (*El Sayed, 2016*). وتتمثّل أسباب محدودية القدرة على الوصول إلى خدمات الطوارئ الطبية في مشكلات على مستوى الحوكمة والتمويل وترتيبات تقديم خدمات الرعاية الصحية.

العوامل المسبّبة

- ← عدم وجود جهة واحدة لإدارة قطاع الطوارئ الطبية، بحيث تكون هذه الجهة تابعة لوزارة الصحة العامة في لبنان وتتولى الإشراف على السياسات العامة المتعلقة بالقطاع وتنظيم العمل فيه وتطويره والتخطيط له.
- ← عدم وجود بروتوكولات للإجراءات الصحية المعيارية على المستوى الوطني أو بروتوكولات المعالجة الطبية ما قبل الاستشفاء ، وكذلك عدم وجود الشهادات والتدريبات المعيارية.
- ← هشاشة الوضع المالي لوكالات خدمات الطوارئ الطبية خاصة على مستوى الاستقرار المالي وقلة التمويل أو عدم كفاءته.
- ← واقع مكونات النظام الصحي في لبنان ما قبل الاستشفاء وتلك التي مقرها المستشفيات، والافتقاد الى التنسيق.

- ← الافتقاد إلى الإشراف الطبي على سير الأعمال اليومية من حيث إدارة الجودة وتحسين الأداء فيما يتعلق بأنشطة خدمات الطوارئ الطبية التي يقدمها عادة الأطباء بهدف الرقابة الطبية المتخصصة.
- ← الافتقاد إلى الوعي في المجتمع المحلي بخصوص خدمات الطوارئ الطبية، وهذا الأمر أساسي لتفعيل نظام خدمات الطوارئ الطبية.

ما الذي نعرفه حول ثلاثة عناصر يتم اعتمادها في المقاربات لمعالجة هذه المشكلة؟

العنصر الأول> توحيد خدمات الإسعاف ما قبل دخول المستشفى من ناحية الإجراءات والتدريب والتعليم.

- ← خلصت أربع مراجعات منهجية أنّ إعداد مبادئ توجيهية ومؤشرات لنظام خدمات الطوارئ الطبية يحسّن جودة الرعاية ويحدّ من معدلات المراضة والوفاة.
- ← خلصت مراجعة منهجية عن تأثير برامج الاعتماد على جودة خدمات الرعاية الصحية إلى أّن هذه البرامج يجب أن تكون مدعومة كوسيلة لتحسين جودة خدمات الرعاية الصحية.
- ← وجدت دراسة تحليلية (meta-analysis) أنّ تشكيل هيئة وطنية موحدة لإدارة خدمات الإسعاف ما قبل الاستشفاء والإشراف عليها هو أمر أساسي.
- ← أشارت إحدى المراجعات المنهجية إلى عدد من المبادرات المشتركة والفعّالة التي يمكن تنفيذها لتحسين معالجة الصدمات (trauma) وخدمات الطوارئ الطبية في الدول ذات الدخل المنخفض والمتوسط، بما في ذلك تقديم خدمات التدريب المعيارية وتوحيد الشهادات والاعتمادات بصورة رسمية لمن يقدمون خدمات الرعاية ما قبل الاستشفاء.
- ← أكّدت إحدى المراجعات المنهجية على أهمية أن تشمل ضمانات الجودة في برامج التعليم المتخصصة في المجال الصحي والطبي معايير تتعلق بالعملية التعليمية وآليات الاعتماد لمقدمي خدمات التعليم والتدريب.

العنصر 2> تحسين نظام الخدمات الصحية من خلال تعزيز خدمات الطوارئ والقدرات الفنية والتقنية للعاملين في قطاع الطوارئ الطبية.

- ← خلصت ثلاث مراجعات منهجية إلى أنّ إجراءات الدعم الأساسي للحياة (Basic Life Support) فعّالة في بيئة ما قبل الاستشفاء وتساهم في الحدّ من المراضة وتحسّن نسب البقاء على قيد الحياة والمعافاة.

- أثبتت إحدى المراجعات المنهجية أنّ خدمات الدعم المتقدم للحياة (Advanced Life Support) والتي تقدّم لحالات معينة، يمكن تأجيلها إلى مراحل لاحقة والتركيز بصورة أكبر على الدعم الأساسي للحياة (Basic Life Support).
- بحسب سبعة مراجعات منهجية وثلاثة دراسات تحليلية، إنّ إجراءات الدعم المتقدم للحياة هي ذات فعالية في التشخيص المبكر، وفي تحسين نسب البقاء على قيد الحياة وإمكانية النقل، خاصة في المناطق النائية والأرياف.
- أشارت ستّ مراجعات منهجية إلى محدودية البيّنات المتوفرة حول فعالية الفرز الطبي خلال نقل المرضى.
- قدّمت إحدى المراجعات المنهجية ذات الجودة المتوسطة بيّنات جيدة عن فوائد خدمات ما قبل الاستشفاء، والتي يقدمها الفريق الطبي من المسعفين المتخصصين في الرعاية الحرجة خاصة في حالات الإصابات البليغة في الدماغ.
- أثبتت أربع مراجعات منهجية وأربعة دراسات تحليلية أنّ استخدام الدعم التقني بالمحاكاة في التدريب يساهم في تحسين معرفة المسعفين ومهاراتهم في ما يخصّ الإنعاش القلبي الرئوي (CPR)، كما يساهم بشكل معتدل في تحسين نتائج المرضى.
- وجدت خمسة مراجعات منهجية وثلاثة دراسات أنّ تدريب الأفراد العاديين على التصرف المناسب يزيد من فعالية تقديم خدمات الدعم الأساسي للحياة وفي رفع معدّلات الأفراد الجاهزين في مكان الحدث، خاصة في المناطق ذات الموارد المحدودة.

العنصر 3> زيادة تمويل الطوارئ الطبية من خلال آليات مختلفة.

- إنّ تكاليف خدمات الطوارئ الطبية مرتبطة بتكاليف المعدات وصيانتها، وأنظمة التواصل، والموارد البشرية، والتدريب والتعليم، والتوجه الطبي، وأنشطة الترخيص والتنظيم.
- وجدت إحدى الدراسات أنّ سياسة الحلول المالية لقطاع خدمات الطوارئ الطبية يجب أن تبدأ من: 1) منهجيات تصميم استعادة التكلفة والتمويل المجتمعي عبر رسوم الاستخدام المناسبة والتمويل الدوري على كافة المستويات أولاً، ومن ثم 2) الانتقال إلى إعداد منهجيات لتشارك التكلفة بين الجهات المحلية والمناطقية والفيدرالية والدولة (الجهة المركزية)، و 3) العمل لتعزيز مشاركة القطاع الخاص وتمويله، وختاماً 4) التعاون مع منظمة الصحة العالمية والبنك الدولي ومنظمة يو أس إيد USAID للتعاون التقني/الفني والمالي. وهناك العديد من المنهجيات التي يمكن استخدامها لتمويل خدمات الطوارئ الطبية مثل: الدفع مقابل الأداء Pay for Performance والضرائب ورسوم الاستخدام وتخصيص خدمات الطوارئ الطبية والقروض المجتمعية.

- وجدت دراستان أنّ مبادئ الدفع مقابل الأداء (Pay for Performance, P4P) هي فعّالة في تحفيز وكالات الطوارئ الطبية والمسعفين لأنّها تساهم في تحسين الأداء ومنهجيّات جمع البيانات لدى الوكالات.
- أشارت سبع دراسات إلى أنّ نظام فرض الضرائب العامة يُستخدم في الدول حيث خدمات الطوارئ الطبية هي ضمن القطاع العام، ويتمّ توفيرها من الحكومة.
- خلصت اثنتان من المراجعات المنهجية واثنتان من الدراسات إلى أنّ قروض المجتمعات المحلية هي وسيلة فعّالة خاصة في أفريقيا.

ما هي الإعتبارات التي يجب أخذها بعين الاعتبار عند التطبيق العملي؟

- يفتقد المرضى إلى الإطلاع الكافي على كيفية الحصول على خدمات الطوارئ الطبية في حالات الطوارئ.
- يفتقد الأشخاص العاديون إلى المعرفة والمهارات اللازمة لإدارة حالات الطوارئ بشكل عام، وبالأخص كيفية التعامل مع الضحايا من الجرحى/المصابين.
- إنّ تدريب أشخاص عاديين هو أمر مكلف للغاية.
- سيتجنب المتخصصون محاولات تطبيق نظام اعتماد جديد بسبب افتقادهم للحوافز المادية والمعرفية والوقت اللازم، وكذلك ترددهم تجاه أي تغيير على الممارسات المكرسة والتي اعتادوها.
- فيما يتعلق بمحاولات تحسين نظام خدمات الطوارئ الطبية، من المحتمل مواجهة مشاكل مثل الضغوطات المالية وعدم تناسب الموارد، مثلاً عند محاولة تحسين أو تنفيذ خدمات الدعم الأساسي للحياة أو الدعم المتقدم للحياة.
- إنّ تطبيق معايير وطنية ومعايير للتعليم والتدريب هي مسألة تتطلب تدريباً وموارداً كما تتطلب وقتاً وهي ذات تكلفة مرتفعة.
- إنّ الموارد اللازمة للتقييم الإحصائي الشامل ولبناء قاعدة بيانات رقمية هي محدودة، بالإضافة إلى التقنيات اللازمة والخبرات والكفاءات في قطاع الطوارئ الطبية.
- إنّ اعتماد المعايير الدولية في لبنان سينطوي على تعقيدات وتحديات، خاصة بسبب السياقات المختلفة لكل دولة.
- لا يوجد لجنة متخصصة لرصد ومراقبة تنفيذ المعايير.

Summary

K2P Policy Brief

The problem

In Lebanon, Emergency Medical Services (EMS) are underutilized and somewhat fragmented and EMS agencies lack adequate resource management including: human, equipment, infrastructure and financial resources. System related challenges at multiple levels are narrowing EMS agencies' effectiveness, efficiency and consequently the continuum of care. As reported by a tertiary hospital in Beirut, EMS agencies transport only 15.2% of patients with 55.2% of stroke patients arriving late to the Emergency Department (El Sayed et al., 2014a). The out-of-hospital survival rate of cardiac arrest in Beirut is low (around 5%) reflecting poor quality service (El Sayed et al., 2014a).These and other system level challenges are leading to low out of hospital survival rates. Use of EMS services varies widely between regions and utilization is low (23.3%) across all regions reflecting problems in underutilization (El Sayed, 2016). Limited EMS care is due to problems at the governance, financing and delivery arrangements.

Size of the problem

In Lebanon, the EMS system in place is fragmented. This is due to the fact that multiple providers shared overlapping responsibilities (El Sayed et al., 2014a). Currently, the Ministry of Public Health (MoPH) is working on new criteria for patient transportation and admission in emergency cases (Al Joumhureya, 2017), marking this issue among the highest priorities within the ministry. Other factors fragmenting the system include: delay in arriving to hospitals, lack of coordination between the various operating EMS agencies (El Sayed et al., 2014a), poor quality of care during pre-hospital transfer of patients (Henry & Reingold, 2012) and limited or inefficient financing allocated to EMS agencies.

Underlying factors

The underlying factors of the problem stem from the health system arrangements in place. At the **governance level,** there is an absence of a governing body operating under the MoPH that leads, oversees, plans, develops policies and regulates EMS system in Lebanon (El Sayed & Bayram, 2013; Bayram, 2007). EMS structure is fragmented with little evidence of partnership among the different stakeholders. This contributes to delays in EMS responses and frequent redundancy of services from different agencies (El Sayed & Bayram, 2013). Due to the absence of an overarching body, national

standard operating procedures or pre-hospital medical treatment protocols, and national standards for certification and training are missing.

At the **financing level**, financial stability of EMS agencies is fragile and financing allocations are little and/or inefficient. There is an absence of a financial legislation to support EMS and 80% of government funds allocated to healthcare are spent on private hospitals. Financing of the system is over-dependent on donor assistance since a funding mechanism to sustain EMS operations and to maintain and update the equipment and infrastructure is lacking.

At the **delivery level**, pre-hospital and hospital-based components of Lebanon health system operate separately without adequate coordination (El Sayed & Bayram, 2013). This is due to the lack of a well-established communication network between the different pre-hospital care stakeholders (El Sayed & Bayram, 2013; Bayram, 2007), and to the underuse of hospital-based stations for prior notification (Bayram, 2007). The majority of ambulances are basic, with BLS equipment, only few ALS ambulances are available to transfer critical patients (El Sayed & Bayram, 2013; Bayram, 2007). Furthermore, physicians do not oversee the care provided by EMS agencies, either on ambulance or by developing standing orders for ambulance operations (Bayram, 2007). Documentation and run sheets for ambulance operations are not applied, which exerts difficulties on auditing performance and implementing quality management projects (El Sayed et al., 2014b; Bayram, 2007). Other challenges faced are: the severely congested roads in Lebanon which may delay EMS ambulances, the recruitment and retention of Emergency Medical Technicians (EMTs), especially day shifts EMTs, and the community's lack of awareness about the EMS system, its role and access numbers (El Sayed & Bayram, 2013).

Elements of a comprehensive approach to address the problem

Element 1› *Ensure standardization of pre-hospital medical procedures, training and education*

Four systematic reviews found that the development of guidelines and indicators for EMS services enhances the quality of care and reduces morbidity and mortality (Murphy, Wakai et al., 2016; Rhudy, Bakitas et al., 2015; Henry & Reingold, 2012; Celso et al., 2006). Two systematic reviews found the use and implementation of accreditation, standard operating procedures and checklists in prehospital emergency medicine to improve the quality of healthcare services (Chen et al., 2016; Alkhenizan & Shaw, 2011). However, one systematic review on the adherence to evidence-based guidelines and protocols in the pre-hospital and emergency care setting showed a wide variation in the results of professionals' adherence to

(inter)national pre-hospital and emergency department guidelines, while adherence in the emergency medical dispatch setting was not reported (Ebben et al., 2013).

To monitor and regulate EMS at a national level, a meta-analysis found that it is important to create a national governing body that overlooks pre-hospital services (Sasson et al., 2010). Two systematic reviews and a low-quality meta-analysis showed that when prehospital care is administered by an EMS physician, survival outcomes improve (Lossius et al., 2012; Böttiger et al., 2016).

There are two additional ways to standardize the quality of care. The first is provide standardized training and formalized certification processes for prehospital care providers (Callese et al., 2015), the second is to standardize national curriculum of the education system (Brooks et al., 2015).

Element 2› *Improve the delivery system by enhancing the emergency services and technical abilities of emergency professionals*

EMS delivery systems used worldwide are classified into Basic Life Support (BLS), Advanced Life Support (ALS) and the tiered response system. The tactic of choice between BLS and ALS is determined by the nature of the emergency that is determined through triage and dispatch, the available services, and the possibilities for starting the treatment in the hospital (LRC, 2016).

Improve the current Basic Life Support system to enhance EMS services

3 systematic reviews found that BLS is effective in pre-hospital setting and reduces morbidity and mortality while ensuring a greater survival rate (Ryynänen et al., 2010; Nichol et al., 1999; Auble, Menegazzi, & Paris, 1995). A systematic review revealed that BLS is a suitable type of intervention for patients with penetrating injuries (Ryynänen et al., 2010).

Integrate Advanced Life Support system to enhance EMS services

One systematic review proved that the Advanced Life Support (ALS) used for specific cases can be done in later stages, but the focus should be on the BLS (Jayaraman & Sethi, 2010). Two systematic reviews concluded that it is a cost effective method (Brunetti et al., 2014; Taylor et al., 2010). According to seven systematic reviews and three meta-analyses ALS is effective in early diagnosis, survival, and transportation especially in rural areas (Pickering et al., 2015; Goodacre et al., 2014; Lidal et al., 2013; Finn et al., 2013; Jensen et al., 2010; Jørgensen et al., 2010; Ryynänen et al., 2010; McDonald & Verbeek, 2006; Brainard et al., 2005; Liberman et al., 2000). On the other hand, five systematic reviews found that there is limited evidence to support pre-hospital

ALS (Pandor et al., 2015; Hubble et al., 2010; Brown & Galloway, 2000; Ioannidis et al., 2001; Nichol et al., 1999). In addition, six systematic reviews and three meta-analysis proved that ALS is not associated with a reduction in mortality in trauma patients and is not effective in improving EMS (Pandor et al., 2015; Jayaraman et al., 2014; Bakalos et al., 2011; Bøtker et al., 2009; McDonald & Verbeek, 2006; Sherbino et al., 2006; Brainard et al., 2005; Liberman et al., 2004; Liberman et al., 2000).

Implement dispatch triage and pre-hospital triage

A medium quality systematic review supported the association between criteria-based dispatch (CBD) or priority pre-hospital dispatch and patient clinical outcome and the link between CBD and improved ambulance utilization (Wilson et al., 2002). A cost analysis study concluded that this method might potentially reduce healthcare costs (Brunetti et al., 2014).Furthermore, 6 systematic reviews pointed out limited evidence on the effectiveness of triage during patient transportation (Pickering et al., 2015; Lidal et al., 2013a; Jørgensen et al., 2010; Brooks et al., 2009; McDonald & Verbeek, 2006; Bryden et al. , 1999).

Enhance service delivery through the employment of certified EMTs

A medium quality review provided good evidence on the benefits of pre-hospital services performed by critical care paramedics in severe traumatic brain injury cases (Vopelius-Feldt et al., 2014). Yet, 5 systematic reviews found little evidence to support paramedics and specified that further research is needed (Vopelius-Feldt et al., 2014; Bigham et al., 2013; Brown et al., 2009; Williams et al., 2008; Black & Brocklehurst, 2003).

Improve training to enhance technical abilities of EMTs

Two systematic reviews revealed that in order to improve and retain CPR knowledge and skills of the paramedics team, several measures are needed and include: the use of CPR feedback/prompt devices in clinical practices (Yeung et al., 2009) and the development of a structured resuscitation training program that also significantly improves patient outcome including survival (Mosley, Dewhurst, Molloy & Shaw, 2012). Four systematic reviews and four meta-analyses showed that the use of technology-enhanced simulation training improves the CPR knowledge and skills for the paramedics team and also moderately improves patient outcomes (e.g. group dynamics, integrated feedback, design features of booster practice) (Cook et al., 2012; Cook et al., 2011; Ilgen et al., 2013; Mundell et al., 2013). One systematic review found inconclusive evidence on Advanced Trauma Life Support (ATLS) training impact (Sethi et al.,2009), while two systematic reviews indicated that

it has no benefit for ambulance crew on patient outcomes (Jayaraman & Sethi, 2010; Jayaraman & Sethi, 2009).

Improve education to enhance delivery of EMS care

An integrative review of literature mentioned that due to the decreased global resources, shortage of skilled health workers, and the growing burden of disease in many low- and middle- income countries, there is a need to maximize the effectiveness and efficiency of pre-service education (Johnson et al., 2013).

Conduct national based community training to improve emergency services and community involvement

Five systematic review and three studies found training of layperson to be effective in the provision of BLS care and in increasing bystander rate of CPR, especially in areas with limited resources (Callese et al., 2014; Plant & Taylor, 2013; Husain & Eisenberg, 2013; Bobrow et al., 2011; Bobrow et al., 2010; Meaney et al., 2010; Vaillancourt et al., 2008; Walker et al., 2003)

Element 3› *Increase the financing of EMS through various methodologies*

A study for the National Emergency Health Policy stated that financing policies should be designed at gradual phases for the implementation of financial schemes. As such, a policy for EMS reform financial solution should start from; 1) designing methods of cost recovery and community financing through appropriate user fees and revolving fund at all levels, 2) devising cost sharing methods between the federal, state, and local governments, 3) seeking for private sector involvement and funding, and finally 4) collaborating with the WHO, World Bank and USAID for the technical and financial support (Aliyu, 2002).

Several methodologies are utilized to finance EMS, such as: Pay for performance, taxation, earmarking, privatizing EMS providers and community loan.

Implementation considerations

At the **patient level**, patients are not aware how to activate the EMS system in case of emergency (El Sayed et al., 2014b). This can be addressed through educating patients (El Sayed & Bayram, 2013) and by promoting both low- and high-intensity media campaigns to increased community awareness (Silver, 2003; Hodgson, 2007).

At the **community level**, people lack the knowledge and skills to manage emergency situations (Pallavisarji, Gururaj, & Girish, 2013) and they lack the confidence to perform CPR, since they are not well trained (Shams et

al., 2016; Pallavisarji et al., 2013). As such, national campaigns should be designed (Groves, 2013), training should be performed more often (Kuramoto et al., 2008) and provided to targeted groups (Groeneveld & Owens 2005).

At the **professional level**, resistance to change may be faced due to the lack of time, knowledge and financial incentives (Brusamento et al., 2012; Alkhenizan & Shaw, 2011). Therefore, the implementation of an accreditation system should be followed by education of the healthcare professionals on the importance of the system (Alkhenizan & Shaw, 2011).

At the **organizational level**, financial stresses and mismatching of resources may be encountered (Callese, 2015). In addition, comprehensive statistical evaluations with digital databases and registries are limited by resources, technology, and expertise for EMS (Bayram 2007). Several strategies can be adopted to resolve these barriers: agencies can develop a network models that encourage the sharing of training resources, billing, administrative functions, and expertise (Knott, 2003), EMS agencies can develop their own policies and procedures based on the state's standards (California Legislative Information, 2016), and medical oversight for paramedic systems can be mandated, or each organization can be required to have a medical director (Zeid, 2001).

At the **system level**, adopting international standards in Lebanon is complicated and challenging due to the different contexts each country has. Also, there is no committee to audit and monitor the implementation of standards. Thus, the choice of KPIs implemented by individual EMS systems should depend on the current clinical and strategic priorities of the specific country (Murphy, 2016). The presence of a governing body should facilitate standards development and implementation. Another strategy is to reduce the complexity of guideline recommendations (Spallek et al., 2010; Brusamento et al., 2012) and to collaborate with academic institutions and scientific societies to contextualize standards, match the local needs and develop best practices.

موجز السياسات الصحية

تعريف المشكلة

تعاني خدمات الطوارئ الطبية في لبنان من عدة تحديات، لعلّ أبرزها ضعف معدلات الاستخدام، والتشتت وضعف أو غياب التنسيق، والافتقاد إلى الإدارة المناسبة للموارد، بما في ذلك الموارد البشرية والمعدات والبنية التحتية والموارد المالية. وتعتبر التحديات على مستوى النظام الصحي بمختلف مستوياته من أبرز العوامل التي تحدّ من فعالية وكفاءة وكالات خدمات الطوارئ الطبية، وبالتالي تحدّ من استمرارية الرعاية. وبحسب إحصائيات إحدى المستشفيات الكبرى في بيروت، فإن خدمات الطوارئ الطبية تنقل فقط حوالي 15.2% من المرضى، كما أن 55.2% من المرضى الذين يعانون من سكتة دماغية يصلون متأخرين إلى طوارئ المستشفى (*El Sayed et al. 2014a*). وتقدّر نسبة البقاء على قيد الحياة في أوساط من يعانون من سكتة قلبية في العاصمة بيروت بحوالي 5% وهي نسبة منخفضة مما يعكس ضعف جودة الخدمة (*El Sayed et al., 2014a*). ويرجع انخفاض معدلات البقاء على قيد الحياة خارج بيئة الاستشفاء إلى مثل هذه التحديات وغيرها على مستوى النظام الصحي، حيث تشهد خدمات الطوارئ الطبية ضعفاً في الاستخدام، وإن كانت معدلات الاستخدام تختلف من منطقة إلى أخرى بصورة شاسعة. لكنّ المعدل العام لجميع المناطق يبقى منخفضاً بحدود حوالي 23.3% (*El Sayed, 2016*). وتتمثل أسباب محدودية القدرة على الوصول إلى خدمات الطوارئ الطبية في مشكلات على مستوى الحوكمة والتمويل وترتيبات تقديم خدمات الرعاية الصحية.

حجم المشكلة

في لبنان، إنّ خدمات الطوارئ الطبية بشكلها الحالي هي مجزّأة. وذلك لأنّ جهّات متعددة تتشارك مسؤوليات متقاطعة (*El Sayed et al., 2014a*). وتعمل وزارة الصحة العامة اليوم على وضع معايير جديدة لنقل المرضى والدخول للاستشفاء في حالات الطوارئ (*Al Joumhureya, 2017*)، وتعتبر الوزارة هذه المسألة من أهم الأولويات داخل الوزارة حالياً. ومن العوامل الأخرى التي تساهم في تجزئة النظام: التأخر في الوصول إلى المستشفيات، ضعف أو غياب التنسيق بين مختلف الجهات التي تعمل في قطاع خدمات الطوارئ الطبية (*El Sayed et al., 2014a*)، وضعف جودة الرعاية خلال نقل المرضى ما قبل الاستشفاء (*Henry & Reingold, 2012*) ومحدودية أو عدم فعالية التمويل المخصّص لوكالات الطوارئ الطبية.

العوامل المسببة

ترتبط غالبية العوامل المسببة بإشكالية الترتيبات القائمة للنظام الصحي الحالي في لبنان. فعلى مستوى **الحوكمة** لا يوجد جهة واحدة مسؤولة عن إدارة قطاع الطوارئ الطبية وتتبع لوزارة الصحة العامة، بحيث تكون هذه الجهة هي المسؤولة عن إدارة القطاع والتخطيط له وتطويره والإشراف عليه ووضع السياسات المتعلقة به وتنظيمه وما إلى ذلك (*Bayram, 2007؛ El Sayed & Bayram, 2013*). ويعاني قطاع خدمات الطوارئ الطبية من التجزئة مع وجود دلالات ضعيفة على شراكات وتنيسق بين مختلف الجهات المعنية. وهذا يساهم في تأخير استجابة وكالات الطوارئ الطبية وعدم ثبات نوعية الخدمات المقدمة من الجهات المختلفة أو نقص خدمات أخرى (*El Sayed & Bayram, 2013*). وبسبب عدم وجود جهة واحدة تدير كافة صلاحيات تنظيم القطاع والإشراف عليه، تغيب أيضاً المعايير الوطنية ولوائح الإجراءات المعيارية على المستوى الوطني وبروتوكولات العلاج والإسعاف الطبي ما قبل الاستشفاء ومعايير التدريب والاعتماد المتخصص والاعترافات الرسمية (أنظمة وطنية للمعادلات والاعتماد).

وعلى المستوى **المالي**، تعاني وكالات خدمات الطوارئ الطبية من عدم الاستقرار المالي وهشاشة الوضع المالي وقلة أو عدم كفاية مخصصات التمويل أو عدم فعاليتها. ولا يوجد تشريعات مالية لدعم خدمات الطوارئ الطبية وبحيث يتوجه حوالي 80% من الإنفاق الحكومي الصحي في مجال الرعاية الصحية إلى المستشفيات الخاصة. ويعتمد تمويل قطاع وكالات الطوارئ الطبية على مساعدات المانحين إلى حدّ كبير، حيث لا يوجد آليات مستدامة لتمويل عمليات خدمات الطوارئ الطبية وما يلزم من تحديث مستمر للمعدات والبنية التحتية.

وعلى مستوى **تقديم الخدمات**، هناك ضعف في تنسيق الخدمات المتعلقة بالرعاية الطبية ما قبل الاستشفاء ثم الرعاية الطبية خلال الاستشفاء (*El Sayed & Bayram, 2013*). وهذا يرجع إلى عدم وجود شبكة تواصل جيدة بين مختلف الجهات المعنية بالرعاية الطبية ما قبل الاستشفاء (*El Sayed & Bayram, 2013؛ Bayram, 2007*)، وإلى ضعف استخدام مراكز الإبلاغ/ الإنذار المسبق التابعة للمستشفيات (*Bayram, 2007*). وتفتقد غالبية سيارات الإسعاف إلى التجهيزات المتقدمة، فأغلبها مجهّز فقط بمعدات الدعم الأساسي للحياة، وقلة فقط هي السيارات المتوفرة مع معدات الدعم المتقدم للحياة، وهي مخصّصة لنقل مرضى العناية الفائقة والحالات الحرجة (*Bayram, 2007؛ El Sayed & Bayram, 2013*). كما وأنّ الأطباء لا يشرفون على الرعاية التي تقدمها وكالات الطوارئ الطبية، سواء على سيارات الإسعاف أو من خلال وضع معايير لعمليات فرق الإسعاف (*Bayram, 2007*). كما لا يتمّ توثيق الرعاية الطبية وما تم تقديمه وإجراؤه في عمليات الإسعاف، وهذا يعيق إمكانية مراقبة

الأداء وتنفيذ مشاريع تتعلق بإدارة وتحسين الجودة (*El Sayed et al., 2014b*؛ *Bayram, 2007*). ومن التحديات الأخرى في هذا المجال: زحمة السير الكثيفة على طرقات لبنان والتي قد تؤخر عمليات الطوارئ، وصعوبات توظيف واستبقاء المتخصصين في مجال الإسعاف، خاصة في الدوامات النهارية، وافتقاد المجتمع المحلي للوعي اللازم عن نظام الإسعاف الطبي ودوره وأهميته وكيفية الاتصال بخدمات الطوارئ على الخط الساخن متى لزم (*El Sayed & Bayram، 2013*).

ما الذي نعرفه حول ثلاثة عناصر يتم اعتمادها في المقاربات لمعالجة هذه المشكلة؟

العنصر 1> توحيد خدمات الإسعاف ما قبل دخول المستشفى من ناحية الإجراءات والتدريب والتعليم.

خلصت أربع مراجعات منهجية إلى أنّ إعداد مبادئ توجيهية ومؤشرات لنظام خدمات الطوارئ الطبية يحسّن من جودة الرعاية ويحدّ من معدّلات المراضة والوفاة (*Murphy, Wakai et al., 2016*؛ *Rhudy, Bakitas et al., 2015*؛ *Henry & Reingold, 2012*؛ *Celso et al., 2006*).

وجدت اثنتان من المراجعات المنهجية أنّ تطبيق معايير وطنية للإعتماد ولوائح معيارية للإجراءات الطبية وقوائم للتحقق من الأداء في طوارئ ما قبل الاستشفاء هي إجراءات تساهم في تحسين جودة خدمات الرعاية الصحية (*Chen et al., 2016*؛ *Alkhenizan & Shaw, 2011*).

بالمقابل، أشارت إحدى المراجعات المنهجية عن مستويات الالتزام بالمبادئ التوجيهية المعيارية وبالبروتوكولات الموحّدة في قطاع الرعاية الطبية ما قبل الاستشفاء وخدمات الطوارئ الطبية، إلى وجود تباين واسع في نتائج مدى التزام المتخصصين الصحيين والطبيين بهذه المبادئ والمعايير سواء كانت وطنية، إقليمية أو دولية، في حين لم يتمّ التبليغ عن الالتزام في إعداد التقارير الطبية الطارئة (*Ebben et al., 2013*).

وبهدف رصد وتنظيم خدمات الطوارئ الطبية على المستوى الوطني، أشارت دراسة تحليلية *(meta-analysis)* إلى أهمية تأسيس هيئة وطنية لإدارة القطاع والإشراف على خدمات ما قبل الاستشفاء (*Sasson et al., 2010*). وقد وجدت اثنتان من المراجعات المنهجية أن معدلات البقاء تتحسن في الحالات التي يتم فيها تقديم خدمات ما قبل الاستشفاء على يد طبيب متخصص في خدمات الطوارئ الطبية، وأيّدت هذه النتائج مراجعة تحليلية موسعة لكنها ذات جودة منخفضة (*Lossius et al., 2012*؛ *Böttiger et al., 2016*).

ونشير في هذا السياق إلى طريقتي عمل يمكن اعتمادهما لتوحيد معايير جودة الرعاية. الطريقة الأولى هي تقديم خدمات التدريب المعيارية مع آلية اعتماد رسمية لمقدمي خدمات الرعاية الطبية ما قبل الاستشفاء (*Callese et al., 2015*)، أما الطريقة الثانية فهي توحيد المنهاج الوطني لنظام التعليم (*Brooks et al., 2015*).

العنصر 2> تحسين نظام الخدمات الصحية من خلال تعزيز خدمات الطوارئ والقدرات الفنية والتقنية للعاملين في قطاع الطوارئ الطبية.

يتمّ تصنيف نظام تقديم خدمات الطوارئ الطبية المستخدم حول العالم وفق التصنيفات التالية: الدعم الأساسي للحياة *Basic Life Support*، والدعم المتقدم للحياة *Advanced Life Support*، ونظام الاستجابة متعددة المراحل *tiered response system*. ويتمّ تحديد التكتيك الذي سيتم العمل به، خاصة فيما يتعلق بالدعم الأساسي للحياة أو الدعم المتقدم للحياة، من خلال تحديد طبيعة الحالة الطارئة من خلال نظام للفرز والتوزيع، بالأخذ بعين الاعتبار الحالة والخدمات المتوفرة واحتمالات بدء العلاج في المستشفى (*LRC, 2016*).

تحسين النظام الحالي لخدمات الدعم الأساسي للحياة بهدف تحسين خدمات الطوارئ الطبية

خلصت ثلاث مراجعات منهجية إلى أنّ إجراءات الدعم الأساسي للحياة (*Basic Life Support*) فعّالة في بيئة ما قبل الاستشفاء وتساهم في الحدّ من المراضة وتحسّن نسب البقاء على قيد الحياة والمعافاة (*Ryynänen et al., 2010*؛ *Nichol et al., 1999*؛ *Auble, Menegazzi, & Paris, 1995*). وقد ذكرت إحدى هذه المراجعات أنّ الدعم الأساسي للحياة هو تدخل مناسب للمرضى المصابين بإصابات اختراق (*penetrating injuries*) (*Ryynänen et al., 2010*).

نظام الدعم المتقدم للحياة لتحسين خدمات الطوارئ الطبية

أثبتت إحدى المراجعات المنهجية أنّ خدمات الدعم المتقدم للحياة (*Advanced Life Support*) والتي تقدّم لحالات معينة، يمكن تأجيلها إلى مراحل لاحقة والتركيز بصورة أكبر على الدعم الأساسي للحياة (*Jayaraman & Sethi, 2010*). وخلصت اثنتان من المراجعات المنهجية الأخرى إلى أنها طريقة فعّالة من حيث التكلفة (*Brunetti et al., 2014*؛ *Taylor et al., 2010*). وبحسب سبعة مراجعات منهجية وثلاثة دراسات تحليلية *meta-analyses*، فإن إجراءات الدعم المتقدم للحياة هي ذات فعالية في التشخيص المبكر، وفي تحسين نسب البقاء وإمكانية النقل، خاصة في المناطق النائية والأرياف (*Lidal et al., 2013*؛ *Goodacre et al., 2014*؛ *Pickering et al., 2015*؛

Ryynänen et al., 2010؛ Jørgensen et al., 2010؛ Jensen et al., 2010؛ Finn et al., 2013؛ Liberman et al., 2000؛ Brainard et al., 2005؛ McDonald & Verbeek, 2006؛ al., 2010). بالمقابل، أشارت خمس مراجعات منهجية إلى محدودية البيّنات المتوفرة لدعم أهمية تطبيقات الدعم المتقدم للحياة ما قبل الاستشفاء (*Pandor et al., 2015؛ Nichol et al., 1999؛ Ioannidis et al., 2001؛ Brown & Galloway, 2000؛ Hubble et al., 2010*). وأيضاً،فقد خلصت ست مراجعات منهجية وثلاثة دراسات تحليلية *meta-analyses* إلى أنّ خدمات الدعم المتقدم للحياة لا ترتبط بالضرورة بانخفاض معدلات الوفيات لدى المرضى المصابين بصدمات حادة، وأنّ هذه الخدمات ليست فعّالة بشكل مثبت في تحسين خدمات الطوارئ الطبية (*Pandor et al., 2015؛ Jayaraman et al., 2014؛ Bakalos et al., 2011؛ Bøtker et al., 2009؛ McDonald & Verbeek, 2006؛ Sherbino et al., 2006؛ Brainard et al., 2005؛ Liberman et al., 2004؛ Liberman et al., 2000*).

تنفيذ نظام لفرز المرضى ما قبل الاستشفاء وتوزيعهم بما يحقق أفضل كفاءة وفعالية في الرعاية

قدّمت إحدى المراجعات المنهجية ذات الجودة المتوسطة بيّنات جيّدة تدعم وجود ارتباط ما بين الفرز المستند إلى معايير *criteria-based dispatch* أو الفرز القائم على الأولوية ما قبل الاستشفاء *priority pre-hospital dispatch* وما بين النتائج العيادية لرعاية المرضى وتحسين استخدام الاسعاف (*Wilson et al., 2002*). وقد وجدت دراسة تحليلية للتكلفة أنّ هذه المنهجية قد تساهم بشكل بارز في الحدّ من تكاليف الرعاية الصحية (*Brunetti et al., 2014*). أيضاً فقد أشارت ست مراجعات منهجية إلى فعالية الفرز خلال نقل المرضى (*Pickering et al., 2015؛ Lidal et al., 2013a؛ Jørgensen et al., 2010؛ Brooks et al., 2009؛ McDonald & Verbeek, 2006؛ Bryden et al. , 1999*).

تحسين آلية تقديم الخدمات من خلال توظيف متخصّصين معتمدين في مجال تقديم خدمات الطوارئ الطبية

قدّمت إحدى المراجعات المنهجية ذات الجودة المتوسطة بيّنات جيدة عن فوائد خدمات ما قبل الاستشفاء، والتي يقدمها الفريق الطبي من المسعفين المتخصصين في الرعاية الحرجة خاصة في حالات الإصابات البليغة في الدماغ (*Vopelius-Feldt et al., 2014*). لكن في السياق نفسه، أشارت خمسة مراجعات منهجية إلى محدودية البيّنات التي تدعم المسعفين وأكدت على أهمية إجراء مزيد من

الأبحاث والدراسات في هذا المجال (*Vopelius-Feldt et al., 2014*؛ *Bigham et al., 2013*؛ *Brown et al., 2009*؛ *Williams et al., 2008*؛ *Black & Brocklehurst, 2003*).

تحسين جودة ومستوى التدريب المقدم لفرق الطوارئ الطبية والمسعفين وخاصة المهارات والقدرات الفنية المتخصصة

كشفت اثنتان من المراجعات المنهجية أنه ولتحسين مستوى المعارف والمهارات المتعلقة بالإنعاش القلبي الرئوي *CPR* لدى المسعفين، يجب اعتماد عدد من الإجراءات والمعايير الصارمة مثلاً: استخدام أجهزة الإنعاش المناسبة والتي تقيس الأداء وتعطي انطباعاً/تقييماً في الممارسات العيادية (*Yeung et al., 2009*) وإعداد برنامج تدريب على الإنعاش بما يساهم بشكل بارز أيضاً في تحسين نتائج المرضى والتعافي، ونسب البقاء على قيد الحياة (*Mosley, Dewhurst, Molloy, & Shaw, 2012*). وقد أثبتت أربع مراجعات منهجية وأربعة تحليلات موسّعة أنّ استخدام الدعم التقني بالمحاكاة في التدريب يساهم في تحسين معرفة المسعفين بالإنعاش القلبي الرئوي ومهاراتهم في هذه المجال، كما يساهم بشكل معتدل في تحسين نتائج رعاية المرضى (مثلاً، ديناميكيات المجموعة، والتقييم والتواصل المدمج، ومعايير تصميم الدعم) (*Cook et al., 2012*؛ *Cook et al., 2011*؛ *Ilgen et al., 2013*؛ *Mundell et al., 2013*). كما وجدت إحدى المراجعات المنهجية أنّه لا يوجد بيّنات واضحة عن تأثير التدريب في مجال الدعم المتقدم للحياة في حالات الإصابات البليغة (*Trauma*) (*Sethi et al.,2009*)، في حين ذكرت اثنتان من المراجعات المنهجية أنّه لا يقدم أي فوائد إضافية لفرق عمل الإسعاف الطبي فيما يتعلق بالتأثير على نتائج الرعاية الطبية للمرضى (*Jayaraman & Sethi, 2010*؛ *Jayaraman & Sethi, 2009*).

تطوير التعليم في ما يتعلق بتحسين تقديم خدمات الطوارئ الطبية والرعاية الطبية في حالات الطوارئ

وجدت إحدى المراجعات المتكاملة للأدبيات *Integrative literature review* أنّه وبسبب النقص في الموارد العالمية، ومحدودية توافر العمال المتخصصين في مجال الرعاية الصحية، والعبء المتزايد للأمراض في العديد من الدول ذات الدخل المنخفض والمتوسط، هناك حاجة إلى زيادة فعالية وكفاءة التعليم ما قبل الانخراط في سلك الخدمة (*Johnson et al., 2013*).

تنفيذ تدريبات للمجتمعات المحلية على المستوى الوطني لتحسين خدمات الطوارئ ومستوى مشاركة المجتمعات المحلية واطلاعها

وجدت خمسة مراجعات منهجية وثلاثة دراسات أنّ تدريب الأفراد العاديين على التصرف المناسب يزيد من فعالية تقديم خدمات الدعم الأساسي للحياة وفي رفع معدلات الأفراد الجاهزين في مكان الحدث، خاصة في المناطق ذات الموارد المحدودة (*Husain & Eisenberg, 2013*؛ *Plant & Taylor, 2013*؛ *Callese et al., 2014*؛ *Meaney et al., 2010*؛ *Bobrow et al., 2010*؛ *Bobrow et al., 2011*؛ *Walker et al., 2003*؛ *Vaillancourt et al., 2008*).

العنصر 3> زيادة تمويل الطوارئ الطبية من خلال آليات مختلفة.

ذكرت دراسة عن السياسة الوطنية لقطاع الطوارئ في المجال الصحي أنّه يجب اعتماد سياسات تمويل للقطاع يتمّ تنفيذها على مراحل. وعليه، فإنّ سياسة الحلول المالية لقطاع خدمات الطوارئ الطبية يجب أن تبدأ من: 1) منهجيات تصميم استعادة التكلفة والتمويل المجتمعي عبر رسوم الاستخدام المناسبة والتمويل الدوري على كافة المستويات أولاً، ومن ثم 2) الانتقال إلى إعداد منهجيات لتشارك التكلفة بين الجهات المحلية والمناطقية والفيدرالية والدولة (الجهة المركزية)، و 3) العمل لتعزيز مشاركة القطاع الخاص وتمويله، وختاماً 4) التعاون مع منظمة الصحة العالمية والبنك الدولي ومنظمة يو أس إيد *USAID* للتعاون التقني/الفني والمالي (*Aliyu, 2002*). وهناك العديد من المنهجيات التي يمكن استخدامها لتمويل خدمات الطوارئ الطبية مثل: الدفع مقابل الأداء *Pay for Performance* والضرائب ورسوم الاستخدام وتخصيص خدمات الطوارئ الطبية والقروض المجتمعية.

ما هي الإعتبارات التي يجب أخذها بعين الاعتبار عند التطبيق العملي؟

على **مستوى المرضى**، هناك افتقاد بشكل عام إلى المعرفة بكيفية الحصول على خدمات الطوارئ الطبية في حالات الطوارئ (*El Sayed et al., 2014b*). وتمكن معالجة هذه الإشكالية من خلال تثقيف المرضى (*El Sayed & Bayram, 2013*) ومن خلال تشجيع الحملات الإعلامية، المكثفة أو العامة، لرفع مستوى الوعي المجتمعي العام (*Hodgson 2007*؛ *Silver 2003*).

وعلى **مستوى المجتمع المحلي**، يفتقد الأشخاص العاديون إلى المعرفة والمهارات اللازمة لإدارة حالات الطوارئ بشكل عام (*Pallavisarji, Gururaj, & Girish, 2013*) كما أنّهم يفتقدون إلى الثقة اللّازمة لإجراء عمليات الإنعاش القلبي الرئوي *CPR* خاصة وأنّهم لم يتلقوا التدريب المتخصص بالشكل الكافي (*Shams et al., 2016*؛ *Pallavisarji et al., 2013*). وبالتالي، لا بد من إعداد حملات على مستوى الدولة

(*Groves, 2013*)، وتقديم التدريبات بوتيرة أكبر (*Kuramoto et al., 2008*) والتركيز في هذا على مجموعات وأشخاص معينين لأنّ تدريب أشخاص عاديين من دون فرز أو انتقاء مجموعات محددة هو أمر مكلف للغاية (*Groeneveld & Owens 2005*).

وعلى **مستوى المتخصصين في تقديم الرعاية الطبية**، قد يسعى المتخصصون إلى تفادي أي محاولة لتطبيق نظام اعتماد جديد بسبب افتقادهم للحوافز المادية والمعرفية والوقت اللازم، وكذلك ترددهم تجاه أي تغيير على الممارسات المكرسة والتي اعتادوها (*Alkhenizan & Shaw, 2011 ؛Brusamento et al., 2012*). وبالتالي، فإنّ استحداث أي نظام اعتماد جديد ووضعه قيد التطبيق يجب أن يتبعه تثقيف وتدريب العاملين في القطاع الصحي وتوضيح أهمية هذا النظام (*Alkhenizan & Shaw, 2011*).

أما على **المستوى التنظيمي**، فمن المحتمل مواجهة مشاكل مثل الضغوطات المالية وعدم تناسب الموارد (*Callese, 2015*). ومن الصعب تنفيذ تقييمات إحصائية شاملة بقواعد بيانات رقمية وسجلات موثقة بسبب محدودية الموارد والتقنيات والخبرات في مجال خدمات الطوارئ الطبية (*Bayram 2007*). ويمكن اعتماد عدد من الاستراتيجيات للتغلب على هذه العوائق، مثل: أن تقوم الوكالات المعنية بتأسيس نماذج أطر تشبيكية تشجع على مشاركة الموارد المتعلقة بالتدريب والفواتير والمهام الإدارية والخبرات المتخصصة (*Knott, 2003*)، أو أن تقوم وكالات خدمات الطوارئ الطبية بوضع سياسات وإجراءات معيارية خاصة بها بالاستناد إلى المعايير الوطنية/الإقليمية (*California Legislative Information, 2016*)، والإشراف الطبي المتخصص على المسعفين وآلية عملهم، أو أن تشترط كل جهة وجود مدير طبي (*Zeid, 2001*).

ختاماً، وعلى مستوى **النظام الصحي**، فإنّ اعتماد المعايير الدولية في لبنان سينطوي على تعقيدات وتحديات بدون شكّ، خاصة بسبب السياقات المختلفة لكل دولة. كما أنّه لا يوجد لجنة متخصّصة لرصد ومراقبة تنفيذ المعايير. وبالتالي فإنّ اختيار معايير تقييم الأداء التي سيتمّ تنفيذها لدى الجهات الفردية في أنظمة خدمات الطوارئ الطبية هو اختيار يجب أن يعتمد على الأولويات الطبية والاستراتيجية الحالية للدولة (*Murphy, 2016*). كما أنّ وجود جهة أو هيئة منظمة للقطاع يجب أن يسهّل مسألة وضع المعايير وتنفيذها والالتزام بها. كما ونشير هنا إلى استراتيجية أخرى معتمدة في هذا السياق وهي الحدّ من درجة تعقيد التوصيات التي ترد في المبادئ التوجيهية (*Spallek et al., 2010 ؛Brusamento et al., 2012*) والتعاون مع المؤسسات الأكاديمية والمجتمعات العلمية لربط المعايير بالسياق المحلي وبالاحتياجات والأولويات المحلية وتحديد أفضل الممارسات.

Content

K2P Policy Brief – Full Report

The Problem

In Lebanon, Emergency Medical Services (EMS) are underutilized and somewhat fragmented and EMS agencies lack adequate resource management including: human, equipment, infrastructure and financial resources. System related challenges at multiple levels are narrowing EMS agencies' effectiveness, efficiency and consequently the continuum of care. As reported by a tertiary hospital in Beirut, EMS agencies transport only 15.2% of patients with 55.2% of stroke patients arriving late to the Emergency Department (El Sayed et al., 2014a). The out-of-hospital survival rate of cardiac arrest in Beirut is low (around 5%) reflecting poor quality service (El Sayed et al., 2014a).These and other system level challenges are leading to low out of hospital survival rates. Use of EMS services varies widely between regions and utilization is low (23.3%) across all regions reflecting problems in underutilization (El Sayed, 2016). Limited EMS care is due to problems at the governance, financing and delivery arrangements.

Size of the Problem

There is an increased need for countries to be prepared in case of national and international health crises. The shift of disease epidemiology towards trauma and acute illness has made the development of EMS systems a public health priority (Callese et al., 2015). The World Health Organization (WHO) stated that integrating an EMS system is integral for healthcare systems to be effective (Varghese et al., 2005). EMS aims to deliver pre-hospital, onsite, and timely emergency medical care to prevent mortality and long-term morbidity during medical emergencies including disasters (El Sayed, 2011; Al-Sahqsi, 2010; WHO, 2008). EMS is defined as "a comprehensive system which provides the arrangements of personnel, facilities and equipment for the effective, coordinated and timely delivery of health and safety services to victims of sudden illness or injury" (Al-Sahqsi, 2010; Moore, 1999). EMS agencies have four main functions to access emergency care, provide care in the community, provide care during transportation, and care upon arrival to the health care facility (Al-Sahqsi, 2010). Each EMS agency has various emergency points, and

Background to Policy Brief

A K2P Policy Brief brings together global research evidence, local evidence and context-specific knowledge to inform deliberations about health policies and programs. It is prepared by synthesizing and contextualizing the best available evidence about the problem and viable solutions and options through the involvement of content experts, policymakers and stakeholders.

The preparation of the Policy Brief involved the following steps:

1) *Selecting a priority topic according to K2P criteria*
2) *Selecting a working team who deliberates to develop an outline for the policy brief and oversee the litmus testing phase.*
3) *Developing and refining the outline, particularly the framing of the problem and the viable options*
4) *Litmus testing by conducting one to one interviews with up to 15 selected policymakers and stakeholders to frame the problem and make sure all aspects are addressed.*
5) *Identifying, appraising and synthesizing relevant research evidence about the problem, options, and implementation considerations*
6) *Drafting the brief in such a way as to present concisely and in accessible language the global and local research evidence.*
7) *Undergoing merit review*
8) *Finalizing the Policy Brief based on the input of merit reviewers, translating into Arabic, validating translation, and disseminating through policy dialogues and other mechanisms.*

a call center or what is known as a dispatch center that answers emergency calls, provides medical advice to the caller and when necessary, dispatches ground EMS (ambulances) or air EMS (helicopters) (WHO, 2008).

There are two models of pre-hospital care: the Franco-German and the Anglo-American models. Debates about which system is better are ongoing. The Franco-German is physician-based with a stay and stabilize model where advanced care is brought to the patient by prehospital physicians (emergency medicine, anesthesia or critical care). This model is mostly used in Europe and physicians are allowed to take complex decisions on scene. The Anglo-American is based on the scoop and run model, where the patient is rapidly brought to the hospital with less pre-hospital interventions. This model relies on trained paramedics and EMTs and is mostly applied in countries such as the United States, Canada, New Zealand, Sultanate of Oman and Australia (Al-Sahqsi, 2010).

Funding mechanisms for EMS systems vary tremendously. There is an increased economic hardship in EMS especially that third party payers in most cases deny coverage of transportation and because resource allocation in EMS is problematic, as the highest cost is that of readiness that is mainly allocated to the readiness of EMTs. Although EMS systems are continuously improving worldwide, pre-hospital care delay is still a problem that many countries face and results in patient adverse events (Mooney et al., 2012; Mitchell et al., 2008). In addition, only few patients attended need to be transported to an Emergency Department (Finn et al., 2013). In the UK, only 10% of patients who contact EMS agencies had life-threatening emergencies (Evans, 2012).

There is an increase in the use of ambulances in developed countries (Finn et al., 2013; Evans, 2012; Brown et al., 2009). In the UK, emergency transportation increased by 170,000 between 2008 and 2011 (Evans, 2012).The frequency of use of EMS in the Middle East is very low (Fares et al., 2011). Studies in the Gulf region found that patients rarely use EMS as a mode of transportation to healthcare facilities (AlHabib, 2016; Callachan et al., 2016; Fares et al., 2011). The majority of patients, 74.3% presenting with heart attack use non-EMS transportation to reach hospitals (AlHabib, 2016). More specifically, in Abu Dhabi, only 17% of patients use EMS (Callachan et al., 2016), in Yemen 2%, Kuwait 7%, Bahrain 23%, Qatar 30%, and Oman 37%, (Fares et al., 2011). While most patients use EMS to be transferred from one facility to more specialized facilities by ambulances that operate under the authority of clinics and/or hospitals. Only 10.2% of patients use these ambulances to be transported from the scene to specialized hospitals (AlHabib, 2016). In addition, a large proportion of EMS technician in the Gulf lack Basic Life Support (BLS) and Advanced Life Support (ALS) certifications, only 83.5% were BLS-certified, 58.2% Advanced Cardiovascular Life Support (ACLS) -certified which explains why advanced medical equipment are not used in ambulances to save lives and time, and is leading to a false positive activation of hospitals (AlHabib, 2016).

In Lebanon, the EMS system in place is fragmented. This is due to the fact that multiple EMS agencies and providers share overlapping responsibilities (El Sayed et al.., 2014a). Other factors fragmenting the system include delays, lack of coordination, poor quality of care and minimal financial allocations. Currently, the Ministry of Public Health (MoPH) is working on new criteria for patient transportation in emergency cases (Al Joumhouria, 2017), marking this issue among the highest priorities within the ministry.

Delay in arriving to hospitals and to the scene is a critical issue. Delay in EMS arrival from the time of collapse due to cardiac arrest in Lebanon is three times the 5-min response time interval benchmark used by most United States' EMS systems (El Sayed et al., 2014b). In addition, more than half of stroke patients (55.2%) arrive late to the Emergency Department (ED) (El Sayed et al., 2014a). Data collected by the LRC on response rate for the year 2016, demonstrated that 14% of emergency calls cancellations are due to congestion and underutilization of ambulance services (Srour & Jabr, 2017). Delay in providing care for emergency patients especially those with acute myocardial infarction increases morbidity and mortality, and therefore timely intervention is critical (Mooney et al., 2012; Evenson et al., 2009). Every 30 minutes of delay results in a 7.5% increased relative risk for 1-year mortality (De Luca et al., 2004). In Pakistan, it was found that initiating therapy in less than 60 minutes decreases mortality and morbidity by 50% (Khan et al., 2007).

Lack of coordination between the various operating EMS agencies in Lebanon also affects delays in the delivery of care (El Sayed et al., 2014a). There are two major ambulance agencies: the Lebanese Red Cross (LRC) and the Civil Defense (CD) (El Sayed & Bayram, 2013; Bayram, 2007). The LRC is part of the International Federation of Red Cross and Red Crescent Societies. Since 1964 the LRC has been the official agency mandated by the MoPH to provide pre-hospital emergency care and transport. The majority of LRC personnel are non-paid volunteers. While the CD is a governmental agency created in 1967 to mitigate personal and property damages or losses resulting from wars or natural disasters and is charged with urban search and rescue missions (El Sayed & Bayram, 2013). There are also other minor agencies representing different social, political, religious, and charitable groups and some private for-profit ambulances available that provide EMS in Lebanon (Bayram, 2007). Al Risala Islamic Scouts, for instance, provides fire and emergency services. It is an independent NGO that does not coordinate with other stakeholders, is funded by a Lebanese political party, and reports to the ministry of defense. In 2016; Al Risala conducted a total of 12,241 missions located mainly in South Lebanon, Beirut and the Bekaa. The LRC total number of emergency response and transport missions in 2016 was 124,701.While the civil defense provided 7,905 ambulance mission and 2,881 rescue missions in 2016 with no coordination with other stakeholders due to the

lack of a unified call center. Furthermore, rural NGOs operate their private ambulances, mainly for corpse transfer since they are not fully equipped.

Furthermore, the different emergency numbers that exist for each of the agencies contribute to delaying emergency care. A survey conducted in southern Lebanon showed that 80% of participants did not have these numbers memorized (El Sayed & Bayram, 2013; Bayram, 2007). This renders the community incapable of properly activating the EMS system, hence delaying their arrival to the ED (El Sayed et al., 2014a).

Poor quality of care during pre-hospital transfer of patients increases morbidity and mortality (Henry & Reingold, 2012). The majority of EMS agencies provide basic pre-hospital medical care services and are volunteer-based with BLS level providers and equipment (El Sayed et al., 2014a; El Sayed & Bayram, 2013). Most rescuers have only basic training and the number of ambulances is not sufficient to meet the population's need (Bayram, 2007). In addition, several elements from the "chain of survival" are lacking in the EMS delivery of care. The chain of survival consists of early access, early CPR, early defibrillation and early advanced care (Al-Sahqsi, 2010). In most cases, EMS agencies do not provide advanced pre-hospital medical care and adopt an overall approach based on rapid transport to hospitals. They are mostly concerned with transportation and transfer of patients rather than actual medical intervention (Bayram, 2007). Functions such as taking and recording vital signs, establishing intravenous access, and administering medications are not performed (Bayram, 2007). But some NGOs such as Al Risala perform advanced life support, however, with limited coverage. Furthermore, the usage of Automated External Defibrillators (AED) by agencies in Lebanon is limited. Since 2014, the LRC ambulances have been fully equipped with Automated External Defibrillators (AED), which are actively used in cardiac arrest patients. The civil defense ambulances are equipped with AED but the cost of the AED pads is expensive limiting its usage. While Al Risala has AED but they are not equipped in all of its ambulance vehicles.

Furthermore, the most common mode of emergency transportation in Lebanon is private. Most patients are transported to hospitals in private cars by family members and are often inadequately transported (El Sayed et al., 2014b; El Sayed & Bayram, 2013; Bayram, 2007). A recent study at a major hospital in Lebanon found that only 15.2% of patients are transported by EMS, 78.8% by private transportation and 6.1% unknown (El Sayed et al., 2014b). The data from the LRC response rate also showed that 17% of emergency calls received by LRC during 2016 were cancelled, of which 38% of cancellations were due to transport of patient in civilian car, while the remaining were due to transport by non-LRC ambulance and the fact that patients do not wait for LRC ambulance, which shows lack of knowledge among the public on the importance of EMS transport (Srour & Jabr 2017). Although private transportation reduces the time of arrival to the ED, a four-year retrospective study that assessed trauma center records in Europe found

that it led to small benefits in terms of mortality as it prolonged time to diagnostic measures and time in the trauma room (Huber et al., 2016).

There is **limited or inefficient financial allocation** to EMS agencies in Lebanon. This limits the agencies' activities and their affordability to repair and replace ambulances and equipment, which results in the use of same consumables on many patients increasing the risk of infections to both patient and volunteer (Overton, 2013). In Lebanon, throughout the last decade, millions of dollars were donated for the development of the emergency healthcare sector, yet the results of different projects remained unsatisfactory (Bayram, 2007). For example, in 2013, it was estimated that the LRC received 4 million USD to fund its operations, instead of the required 10 million USD (Overton, 2013). Whereas, the civil defense does not accept cash from donors, which decreases their funds keeping them highly dependent on the Ministry of Interior's limited financial allocations.Resource allocation disparities make a unified EMS system difficult to implement (Pozner et al., 2004). According to the WHO, fragmented health financing schemes are an obstacle for optimal health system performance in some high-income countries (WHO, 2007).

Underlying Causes

Governance

There is an absence of a governing body operating under the MoPH that leads, oversees, plans, develops policies and regulates EMS systems in Lebanon (El Sayed & Bayram, 2013; Bayram, 2007). EMS structure is fragmented with little evidence of partnership among the different stakeholders, and variation in its utilization among different Lebanese regions. Operation and administration of the different EMS agencies in Lebanon are totally independent and the different EMS agencies report to different authorities. The LRC reports to the MoPH, the CD and other small municipal agencies report to the MoPH and the Ministry of Interior. The lack of a unified dispatch center that coordinates EMS activities and the absence of a single emergency access number for EMS, contribute to delays in EMS responses and frequent redundancy of services, and multiple ambulances from different agencies responding to the same scene (El Sayed & Bayram, 2013). Despite that, the LRC worked on improving their dispatch center by implementing a new computerized dispatch system (LRC, 2016).

Due to the absence of an overarching body, national standard operating procedures or pre-hospital medical treatment protocols are missing. As such, different EMS agencies implement different plans, regulations and standard operating procedures (El Sayed & Bayram, 2013). Additionally, the absence of standardized regulations limits pre-hospital interventions to first aid, cardiopulmonary resuscitation (CPR), infrequent Automated External Defibrillators (AED) use (when available), and transport to the closest facility (El Sayed &

Bayram, 2013). This, in turn, influences the use of priority medical dispatch and emergency medical dispatch protocols, which is not available in Lebanon (El Sayed & Bayram, 2013; Overton, 2013).

There are currently no national standards for certification and training, including continuing medical education, nor is there a national database of pre-hospital care providers (El Sayed & Bayram, 2013; Bayram, 2007). The absence of standards regarding training, education, and skills of EMS providers affects the scope of practice and limits it to BLS (El Sayed & Bayram, 2013). As a result, some agencies such as AL Risala and the CD and LRC adopt their own non-governmental certificates. The LRC provides an initial 120 hours training in first aid, CPR, AED use, urgent transport, and other basic life support skills to their personnel. This is followed by 3 to 6 months of ambulance ride-along training. LRC also provides continuous training to providers who remain active in EMS (El Sayed & Bayram, 2013). Similarly, the CD provides 3 months of pre-hospital care training to its personnel (Bayram, 2007) and Al Risala is planning to open its own institute to train its volunteers.

In addition, completing residency training in Emergency Medicine is not a requirement by the MoPH and the Order of Physicians to practice in the Emergency Department (ED). Therefore, most EDs are staffed by general practitioners and lack the required expertise. To advance Emergency Medicine, only the American University of Beirut Medical Center (AUBMC) launched an academic residency and training program in Emergency Medicine (El Sayed & Bayram, 2013). Also, there are no programs in universities or institutes that are specialized in paramedics.

Furthermore, the categorization of hospitals that is employed by the MoPH relies on hospitals' compliance with the national accreditation system which does not take into account the capacities of these hospitals to function as emergency care facilities (El Sayed & Bayram, 2013). Therefore, categorization of existing hospitals as emergency care facilities and trauma centers is needed to guide EMS agencies' work.

Financing

In Lebanon, financial stability of EMS agencies is fragile, financing allocations are little and/or inefficient. Financing of the system is over-dependent on donor assistance since a funding mechanism to sustain EMS operations and to maintain and update the equipment and infrastructure are lacking.

There is an absence of a financial legislation to support EMS and 80% of government funds allocated to healthcare are spent on private hospitals. The LRC and CD do not bill for pre-hospital services, and most EMS agencies rely on funding and grants from either the government or international agencies, which is not always sustainable (El Sayed & Bayram, 2013).

Some funding to the LRC and CD pre-hospital providers operating during daytime hours (6 AM-6 PM) is provided by the MoPH and by municipalities. Other funding is provided to the CD through the Ministry of Interior to support emergency equipment and salaries and benefits of providers. The LRC, and to a lesser extent the CD, benefit from donor assistance such as grants and Non-Governmental Organizations support. Donations often include ambulances and emergency equipment or provider training grants (El Sayed & Bayram, 2013).

Over the years, millions of dollars were provided from donors to develop and improve the emergency healthcare sector in Lebanon. Results from these projects have been less than satisfactory (Bayram, 2007). Financing allocations are inefficient; there is no system available in place for resource management, to assess the available resources, and to monitor the expenditures or the utilization of funds and equipment donated. Also, the improvement plans for Emergency Medicine leave behind hospital-based emergency care and focus on the pre-hospital system only. In 1996, the Kuwaiti government donated money to develop a master plan for emergency health care in Lebanon, and a French consulting agency was hired to produce recommendations based on the French emergency medical system, but none of the suggestions were implemented. In 1999, the French government donated money and equipment to develop a pre-hospital system in South Lebanon, a study was completed but again not implemented. In 2000, the Italian government donated money, an emergency training center equipped with high technology equipment, and eight ALS ambulances to the MoPH. The ministry has yet to adopt a clear plan for its utilization. The center was shut down for several years but recently resumed operation with very restricted capacity. Other than the annual budget to the Lebanese Red Cross, there has never been a specific portion of the MoPH's annual budget allocated to improve the emergency health care sector (Bayram, 2007).

Limited financing is provided to EMS agencies. For example, to meet the needed amount of funds, the LRC requires around 10 million USD a year to adequately fund its processes. However, in the 2013 fiscal year, it was anticipated that LRC received 4 million USD only. The MoPH allocates 10% of its funds to EMS, which is insufficient. This is limiting maintenance and replacement of ambulances and equipment and resulting in the use of same consumables on many patients, thus, increasing the risk of infections to both patient and volunteer (Overton, 2013).

Delivery

Pre-hospital and hospital-based components of Lebanon health system operate separately without adequate coordination (El Sayed & Bayram, 2013). A well-established communication network between the different pre-hospital care stakeholders (ED, hospitals, and EMS agencies) is missing and there is no unified hotline for emergency calls (El Sayed & Bayram, 2013; Bayram, 2007). Hospital based stations are not in use and ambulances rarely notify the ED

of the impending arrival of critical patients (Bayram, 2007). This action is based on a mandatory memo issued by the MoPH that forbids ambulances from notifying hospitals about patient's arrivals to reduce delays (MoPH, 2006). CD and LRC have established a VHS radio network between each agency's ambulances and regional centers, however, both agencies rarely communicate with each other. Roles of CD and LRC are not well divided. Also, most regions have an overlap in EMS coverage between the two agencies, while there is no coordination between them (El Sayed & Bayram, 2013). EMS agencies cannot determine whether hospital ED is capable of admitting a patient transported, due to lack of prior communication or notification, communication is only required for inter-facility transport (El Sayed & Bayram, 2013).

Ambulance types, equipment, quality, and quantity differ between the various EMS agencies and sometimes within the same agency. The majority of ambulances are basic, with BLS equipment. Only few ALS ambulances are available to transfer critical patients. In 2001, six ambulances were donated by the Italian government and are rarely utilized, while the majority are private for-profit and require a pre-paid fee (El Sayed & Bayram, 2013; Bayram, 2007).

Furthermore, day-to-day oversights on ambulance runs that are usually performed by physicians for medical control are lacking (Bayram, 2007). Physicians do not oversee the care provided by EMS agencies, either on ambulance or by developing standing orders for ambulance operations (Bayram, 2007). Documentation and run sheets for ambulance operations are not applied, which exerts difficulties on auditing performance and implementing quality management projects (El Sayed et al., 2014b; Bayram, 2007). Another factor that is impeding improvement of the services is the fact that EMS agencies do not have a set of quality performance indicators to quantify operations (LRC, 2015).

The severely congested roads in Lebanon may be a reason why EMS ambulances are delayed. The road network in Lebanon suffers from inadequate maintenance leading to a low traffic capacity leading to slow traffic flows and congestion costing Lebanon 3.5 billion dollars. This cost comes from travel delays, increased impact on the environment, increased vehicle costs from travel delays and increased chance of vehicle collisions and poor road safety conditions (Choueiri et al. 2015). Data collected by the LRC on response time shows that in addition to congestion problems, which are mostly faced in daytime (day response time is 50% higher than night time) poor healthcare facilities' admission services and long travel distance to reach facilities outside Beirut cause delays. This is demonstrated in the 50% increase in response time in South Lebanon compared to Beirut (Srour & Jabr, 2017).

Recruitment and retention of volunteers, especially day shifts volunteers, is a challenge faced by most EMS agencies. Between 1994 and 2013, the number of LRC day shift teams increased from 16 to 40, while the number of emergency calls increased by more than 300% with the majority occurring during

the day when the number of volunteers is the least (LRC, 2013). Currently, the LRC day shift teams reached 72 volunteers. The lack of volunteers, especially in daytime, is affecting the number of patients receiving care. An assessment of the Lebanese EMS showed that 60% of patients who need care are not responded to by ambulances, and at many stations, at least 50% more shifts are needed to meet the required care (Overton, 2013).

Community awareness is also crucial for an effective EMS system, yet is still lacking in Lebanon. Patients are sometimes unaware of the EMS system, its role and access numbers (El Sayed & Bayram, 2013). This is leading to the delay in reaching hospitals, especially that patients are unaware of symptoms such as those of a stroke which leads to poor recognition of symptoms and a delay in activation of EMS (El Sayed et al., 2014a). Therefore, investing in community awareness on EMS and health literacy is vital.

Elements of a comprehensive approach to address the problem

Element 1

Ensure standardization of pre-hospital medical procedures, training and education

Element 2

Improve the delivery system by enhancing the emergency services and technical abilities of emergency professionals

Element 3

Increase the financing of EMS through various methodologies

Elements

Policy Elements and Implementation Considerations

SUMMARY

Element 1
Ensure standardization of pre-hospital medical procedures, training and education.

Element 2
Improve the delivery system by enhancing the emergency services and technical abilities of emergency professionals.

Element 3
Increase the financing of EMS through various methodologies

Element 1

Ensure standardization of pre-hospital medical procedures, training and education.

The development of national standards, operating procedures or pre-hospital medical treatment protocols are the most influential mechanism for standardizing and assessing the performance of EMS agencies (El Sayed & Bayram, 2013).

Four systematic reviews found that the development of guidelines and indicators for EMS services enhances the quality of care and reduces morbidity and mortality (Murphy et al., 2016; Rhudy et al., 2015; Henry & Reingold, 2012; Celso et al., 2006). One systematic review found the use and implementation of standard operating procedures and checklists in prehospital emergency medicine to improve guidelines adherence and patient outcomes in airway management, patient records, identification and triage, and other prehospital interventions (Chen et al., 2016).

One systematic review on the impact of accreditation programs on the quality of healthcare services indicated that those programs should be supported as a tool to improve the quality of healthcare services (Alkhenizan & Shaw, 2011). International standards are available for independent EMS agencies and for hospital ambulance/ transportation services. The EMS Authority at the State of California and the Iowa Department of Public Health developed EMS system standards and guidelines for independent agencies. The standards cover: 1) system organization and management, 2) staffing/ training, 3) communication, 4) response/ transportation, 5) facilities/ critical care, 6) data collection/ system evaluation, 7) public evaluation and education, and 8) disaster management response (Iowa Department of Public Health, 2010; EMSA, 1993). The California 1797.220 law states that EMS agencies can develop their own policies and procedures based on the state's standards, as long as they are approved by a medical director. The policies and procedures require basic life support emergency medical transportation to meet minimum dispatch, patient care guidelines, patient destination policies, and quality assurance requirements (California Legislative Information, 2016). Another example of independent agency standards is those developed by the Commission on Accreditation of Ambulance Services of Illinois. The standards cover the following: 1) organization, 2) inter-agency relations, 3) management, 4) financial management, 5) community relations and public affairs, 6) Human resources, 7) clinical standards, 8) safe

operations and managing risks, 9) equipment and facilities, and 10) communications center (CAAS, 2016). Whereas hospital based accreditation systems that have a section related to EMS standards are such as the Joint Commission International (JCI) that focuses on the process and safety of patient transfer and meeting patient transportation needs. Another example is Accreditation Canada International (ACI) that mostly focuses on partnering with EMS agencies, determining barriers to access to the ED including transfer and measuring ambulance offload response time. A third example from the region is the Central Board for Accreditation of Healthcare Institutions that was developed for hospitals in the Kingdom of Saudi Arabia, the program focuses on maintaining effective ambulance services and on the readiness of ambulances in times of disaster.

An example of a standard that should be implemented and audited is response time. The most commonly accepted standard response time for EMS agencies is 8 minutes (Shah, 2006).The standard on response time was assessed by various studies. One study found that EMS agencies response time to phone calls that is less than 5 minutes is associated with improved survival when compared with the response that exceeded 5 minutes (Blackwell & Kaufman, 2002). Another study, found that patients who wait 10:59 minutes or less for ALS response when compared to patients who wait longer than 10:59 minutes could experience between a 6% and a 4% decrease in mortality, and do not have an increase in critical procedures performed in the field (Blackwell et al., 2009). On the other hand, exceeding the ambulance industry response time criterion of 8 min does not affect patient survival after traumatic injury (Pons & Markovchick, 2002). In addition, evidence on a paramedic response time within 8 minutes is not associated with improved survival to hospital discharge after controlling for several important confounders, including the level of illness severity. However, a survival benefit was identified when the response time was within 4 minutes for patients with intermediate or high risk of mortality (Pons et al., 2005).

One systematic review of the international literature on quality measures and outcomes of pre-hospital ambulance service care identified a broad range of outcome measures to provide a more meaningful assessment of ambulance service care by developing new outcome measures in pre-hospital research and quality improvement (Phung et al., 2015). These outcomes measures can be used along with other guides to improve and standardize the pre-hospital quality of care.

One guide that can be referred to is the WHO "Prehospital Trauma Care System". The guide focuses on affordable and sustainable interventions and components of pre-hospital trauma care systems that require minimal training and relatively little in the way of equipment or supplies (WHO, 2005). The "Pre-hospital Emergency Care Key Performance Indicators for Emergency Response Time" is another guide developed for Ireland's healthcare system to improve the

quality of EMS care through response time and by providing six key performance indicators (Health Information and Quality Authority, 2012). Agencies such as the LRC developed a five years strategic plan for 2008- 2012 and revised it to develop its 2013- 2018 strategic plan. This plan can also be referred to for developing a national strategic plan. The strategies aim at improving access to effective pre-hospital care and were developed to overcome barrier LRC faces. Such barriers include difficulties in recruitment and retention of volunteers, the lack of performance indicators, financial instability for short and long-term needs, and the lack of an integrated EMS system (IFRC, 2011). Another quality improvement project developed by the LRC in 2015 and which has entered into effect in March 2016 includes: updating all clinical protocols, creating an electronic patient care report, deploying field training officers and enhancing medical oversight (LRC, 2015).

However, one systematic review on the adherence to evidence-based guidelines and protocols in the pre-hospital and emergency care setting showed a wide variation in the results of professionals' adherence to (inter)national pre-hospital and emergency department guidelines, while adherence in the emergency medical dispatch setting was not reported (Ebben et al., 2013).

To monitor and regulate EMS at a national level, a meta-analysis found that it is important to create a national governing body that overlooks pre-hospital services (Sasson et al., 2010). The governing body can operate under the MoPH, and a medical director should be assigned to oversee the day to day EMS system. The governing body function consists of developing evidence-based national standards, protocols, and indicators (El Sayed & Bayram, 2013). The California law 1797.274, under the EMS section, clearly defines the role of an emergency medical care committee that shall review on a yearly basis the ambulance services, training programs and the first aid practices (California Legislative Information, 2016).

Medical oversight is integral to all aspects of EMS. One primary study suggested that EMS professionals benefit when in direct contact with a physician medical director and that physician involvement is important to ensure quality prehospital care. EMS professionals, however are rarely in contact with medical directors. In addition, little research is available on the quality and quantity of medical oversight in EMS (Studnek et al., 2009). Two systematic reviews showed that when prehospital care is administered by an EMS physician, survival outcomes improve in the following cases: cardiac arrest, trauma, respiratory diseases, trauma and myocardial infarction (Böttiger et al., 2016; Bøtker et al., 2009). A low-quality meta-analysis showed that physician-led prehospital emergency tracheal intubation, muscle paralytics or rapid sequence induction (RSI) is linked to fewer failures compared to the ones administered by non-physicians (Lossius et al., 2012).

One systematic review stated that in Australia, ambulance service medical directors have responsibility for oversight of not only clinical management guidelines but clinical education as well (Brooks et al., 2015). In the USA, different states and countries have created councils and boards to oversee EMS services. For instance, the Delaware Emergency Medical Services Oversight Council (DEMSOC) was formed in 1999 to ensure that all elements of the system are functioning in a coordinated, effective, and efficient manner in order to reduce morbidity and mortality rates for the citizens of Delaware, and to ensure the quality of EMS services (DEMSOC, 2006). In addition, the council assigns EMS medical directors for each county that report to the state EMS medical director to review statewide treatment protocols, quality issues, new medical techniques, and equipment in a continuing effort to provide the citizens with the most up-to-date and appropriate EMS care possible (DEMSOC, 2006). Another example is Whatcom County EMS Oversight Board that makes recommendations regarding administration, operations, and levels of service and EMS budgets (Whatcom County, 2016).

In addition, a systematic review identified common effective initiatives to improve trauma services and EMS in Low and Middle-Income Countries, including the provision of standardized training and formalized certification processes for prehospital care providers (Callese et al., 2015). Two studies mentioned the importance of a standardized competency and training framework for ambulance dispatchers using protocols, tools, and training that meet international guidelines for stroke care (Acker et al. 2007; Woollard, 2006).

Another way to standardize and improve care is through education. One systematic review found that quality assurance in health professional education incorporates educational standards and accreditation processes for education providers. National curriculum standards and program accreditation processes exist in countries such as the US and Australian pre-hospital education systems, which were found to be effective (Brooks et al., 2015). An example is the National Emergency Medical Services Education Standards developed by the National Highway Traffic Safety Administration (NHTSA, 2016).

An annual report published by the Council Ambulance Authorities mentioned that the accreditation of higher education paramedic programs is in continuous progress with the development of competency standards available to all participating higher education providers (CAA, 2010). A single study report provided the integration of the accreditation council for graduate medical education core competencies into the model of the clinical practice of emergency medicine in the USA. It provides a framework for the Council of Emergency Medicine Residency Directors (CORD) and the Society for Academic Emergency Medicine to develop a curriculum in emergency medicine and program requirement revisions (Chapman et al., 2004).

Table 1 **Key findings from systematic reviews and single studies**

Category of finding	Element 1
Benefits	1 systematic review proved that ambulance service performance measurement has previously focused on response times and survival care but now EMS can focus on developing new outcome measures in prehospital research and quality improvement (Phung et al., 2015).
	One systematic review shed light on the importance of the development of key performance indicators for pre-hospital emergency care to improve the quality of pre-hospital care and safety of patient care in the pre-hospital setting (Murphy et al., 2016).
	One systematic review mentioned that accreditation programs improve the process of care provided by healthcare services and improve clinical outcomes of a wide spectrum of clinical conditions (Alkhenizan & Shaw, 2011).
	One systematic review mentioned that guidelines enhance the effectiveness of regionalized care and reduce rates of disparities in access and outcomes (Rhudy et al., 2015).
	One systematic review and meta-analysis showed a 15% reduction in mortality in favor of the presence of a trauma system (Celso et al., 2006). Another systematic review and meta-analysis encouraged the adoption of the WHO pre-hospital trauma system manual in developing countries (particularly middle-income countries) that helps in reducing mortality. It also illustrated the importance of adopting pre-hospital trauma systems at the policy level. The study showed that the adoption of such system decreases the risk of dying from trauma by 25% and reduces in-field response time (Henry & Reingold, 2012).
	A Task Force in the United States in 2004 recommended the establishment of stroke systems of care and recognized the activation and response of EMS as critical components of effective stroke systems of care to reduce mortality and morbidity rates (Schwamm, et al., 2005).
	A single report published by the Council Ambulance Authorities the development of competency standards available to all participating higher education providers will provide easier movement of paramedics across jurisdictions leading to flow of benefits from those movements (CAA, 2010).
	1 systematic review on the adherence to guidelines and protocols in the pre-hospital and emergency care setting showed that professionals' adherence to (inter)national pre-

Category of finding	Element 1
	hospital and emergency department guidelines shows a wide variation, while adherence in the emergency medical dispatch setting is not reported future research should identify such factors to allow the development of strategies to improve adherence and thus improve quality of care (Ebben et al., 2013).
Potential harms	No evidence was found on the potential harms.
Cost and/ or cost effectiveness in relation to the status quo	A systematic review and a meta-analysis proved that the development of standards and guidelines decrease morbidity and mortality rates which in return decrease the cost on hospitals and governments (Rhudy et al. 2015; Henry & Reingold, 2012). A single study stated that a low-cost rural trauma system had an effective impact on mortality in low-income countries (Husum et al., 2003).
Uncertainty regarding benefits and potential harms (so monitoring and evaluation could be warranted if the approach element were pursued)	One systematic review found that the absence of standards and treatment protocols to enhance pre-hospital services makes it difficult to transfer findings from the US to the UK context in the findings of barriers and facilitators for minority groups to access pre-hospital care (Windle et al., 2015). 1 systematic review showed controversial results regarding the optimal time interval from symptom onset or medical contact that will benefit from prehospital interventions for Acute myocardial infarction (McDonald & Verbeek, 2006) 1 systematic review encountered the problem of incomplete information for EMS such as pain scales when these had been used or using survival without a specific time period (Phung et al., 2015).

Element 2

Improve the delivery system by enhancing the emergency services and technical abilities of emergency professionals

There are several types of EMS delivery systems used worldwide, these are classified into Basic Life Support (BLS), Advanced Life Support (ALS) and the tiered response system. BLS involves non-invasive basic interventions and rapid transportation, ALS includes all BLS procedures with the addition of invasive procedures, while the tiered response system utilizes both BLS and ALS,

dispatching ALS in more severe events and BLS for non-urgent cases and transportation of stable patients (Al-Shaqsi, 2010).

The choice between BLS and ALS is determined by the nature of the emergency that is determined through triage and dispatch, the available services, and the possibility of starting the treatment in the prehospital field (LRC, 2016).

Improve the current Basic Life Support system to enhance EMS services

While there is a need to develop and implement standards, enhancing Basic Life Support is essential to improve the quality of care provided by EMS agencies and hospital ambulances.

Basic Life Support (BLS) is the cornerstone of resuscitation and it is well established that bystander CPR is critical to survival in out-of-hospital cardiac arrests (Perkins et al., 2015). 3 systematic reviews found that BLS is effective in pre-hospital setting and reduces morbidity and mortality while ensuring a greater survival rate (Ryynänen et al., 2010; Nichol et al., 1999; Auble et al., 1995). In addition, a basic pre-hospital trauma life support (PHTLS) program demonstrated improved cognitive and trauma management skills performances among pre-hospital paramedical personnel who complete the basic PHTLS program (Ali et al., 1998).

Integrate Advanced Life Support system to enhance EMS services

A systematic review proved that the Advanced Life Support (ALS) used for specific cases can be done in later stages, but the focus should be on the BLS (Jayaraman & Sethi, 2010). A study found that the addition of a specific regimen of out-of-hospital ALS interventions to an existing EMS system that provides BLS was associated with a decrease in the rate of death of 1.9 percentage points among patients with respiratory distress (Stiell et al., 2007).

The implementation of the ALS support needs a greater budget than BLS. However, two systematic reviews concluded that it is a cost effective method (Brunetti et al., 2014; Taylor et al., 2010). Mixed evidence is available on ALS. On the one hand, according to seven systematic reviews and three meta-analyses ALS is effective in early diagnosis, survival, and transportation especially in rural areas (Pickering et al., 2015; Goodacre et al., 2014; Lidal et al., 2013; Finn et al., 2013; Jensen et al., 2010; Jørgensen et al., 2010; Ryynänen et al., 2010; McDonald & Verbeek, 2006; Brainard et al., 2005; Liberman et al., 2000). On the other hand, five systematic reviews found that there is limited evidence to support pre-hospital ALS (Pandor et al., 2015; Hubble et al., 2010; Brown & Galloway, 2000; Ioannidis et al., 2001; Nichol et al., 1999). In addition, six systematic reviews and three meta-analysis proved that ALS is not associated with a reduction in mortality in trauma patients and is not effective in improving EMS (Pandor et al., 2015;

Jayaraman et al., 2014; Bakalos et al., 2011; Bøtker et al., 2009; McDonald & Verbeek, 2006; Sherbino et al., 2006; Brainard et al., 2005; Liberman et al., 2004; Liberman et al., 2000).

Implement dispatch triage and pre-hospital triage

A medium quality systematic review supported the association between criteria-based dispatch (CBD) or priority pre-hospital dispatch and patient clinical outcome and the link between CBD and improved ambulance utilization (Wilson et al., 2002). A cost analysis study of pre-hospital triage with telemedicine electrocardiogram (ECG) in the case of suspected acute cardiac disease concluded that this method might potentially reduce healthcare costs (Brunetti et al., 2014).

Furthermore, 6 systematic reviews pointed out limited evidence on the effectiveness of triage during patient transportation (Pickering et al., 2015; Lidal et al., 2013a; Jørgensen et al., 2010; Brooks et al., 2009; McDonald & Verbeek, 2006; Bryden et al., 1999). 1 systematic review on triage systems for pre-hospital emergency medical services concluded that there is an evidence gap regarding the effects of pre-hospital triage systems and the effects of using the same triage system in two or more settings of the EMS, however, this finding does not mean that pre-hospital triage systems are ineffective, but knowledge about potential effects is scarce (Lidal et al., 2013).

Enhance service delivery through the employment of certified EMTs

To meet the minimum required EMS standards, EMS agencies and hospitals should certify, recertify and accredit EMS personnel (CAAS, 2016; Iowa Department of Public Health, 2010; EMSA, 1993).

A medium quality review provided good evidence on the benefits of pre-hospital services performed by critical care paramedics in severe traumatic brain injury cases (Vopelius-Feldt et al., 2014). Studies showed that paramedic practitioners schemes resulted in reduced ED attendance (Cooper & Grant, 2009; Dixon et al., 2009; Mason et al., 2007) and led to prompt treatment and appropriate referral when necessary (Cooper & Grant, 2009; Mason et al., 2007).

Yet, 5 systematic reviews found little evidence to support paramedics and specified that further research is needed (Vopelius-Feldt et al., 2014; Bigham et al., 2013; Brown et al., 2009; Williams et al., 2008; Black & Brocklehurst, 2003).

Improve training to enhance technical abilities of EMTs

Two systematic reviews revealed that in order to improve and retain CPR knowledge and skills of the paramedics team, several measures are needed and include: the use of CPR feedback/prompt devices in clinical practices (Yeung

et al., 2009) and the development of a structured resuscitation training program that also significantly improves patient outcome including survival (Mosley et al., 2012).

One methodology used for training is simulation. Four systematic reviews and four meta-analyses showed that the use of technology-enhanced simulation training improves the CPR knowledge and skills for the paramedics team and also moderately improves patient outcomes (e.g. group dynamics, integrated feedback, design features of booster practice) (Cook et al., 2012; Cook et al., 2011; Ilgen et al., 2013; Mundell et al., 2013). Another methodology is Advanced Trauma Life Support (ATLS) training, one systematic review found inconclusive evidence on its impact (Sethi et al.,2009), while two systematic reviews indicated that ATLS has no benefit for ambulance crew on patient outcomes (Jayaraman & Sethi, 2010; Jayaraman & Sethi, 2009).

Improve education to enhance delivery of EMS care

An integrative review of literature mentioned that due to the decreased global resources, shortage of skilled health workers, and the growing burden of disease in many low- and middle- income countries, there is a need to maximize the effectiveness and efficiency of pre-service education (Johnson et al., 2013).

A thematic review conducted with UK ambulance service staff have stated a number of issues such as the desire for higher education curriculum that balances theory and practice; the need for valid and reliable assessment methods and the development of a supportive mentorship framework with emphasis on self-directed professional development focusing on deskilling issues and inter-professional collaborative links (Cooper, 2005).

One high-quality study identified twelve specific strategies from high-performing paramedic education programs, these are: 1) achieve and maintain national accreditation; 2) maintain high-level entry requirements and prerequisites; 3) provide students with a clear idea of expectations for student success; 4) establish a philosophy and foster a culture that values continuous review and improvement; 5) create your own examinations, lesson plans, presentations, and course materials using multiple current references; 6) emphasize emergency medical technician (EMT)-Basic concepts throughout the class; 7) use frequent case-based classroom scenarios; 8) expose students to as many pre-hospital ALS patient contacts as possible, preferably where they are in charge; 9) create and administer valid examinations that have been through a review process (such as qualitative analysis); 10) provide students with frequent detailed feedback regarding their performance (such as formal examination reviews); 11) incorporate critical thinking and problem solving into all testing; and 12) deploy predictive testing with analysis prior to certification (Margolis et al., 2009).

Conduct national based community training to improve emergency services and community involvement

Five systematic review and three studies found training of layperson to be effective in the provision of BLS care and in increasing bystander rate of CPR, especially in areas with limited resources (Callese et al., 2014; Plant & Taylor, 2013; Husain & Eisenberg, 2013; Bobrow et al., 2011; Bobrow et al., 2010; Meaney et al., 2010; Vaillancourt et al., 2008; Walker et al., 2003).

Paramedics may have a valuable role in rural community health capacity and health promotion including first aid teaching, but this requires further investigation to identify the exact characteristics and benefits of such roles. According to one systematic review, there is inconclusive evidence to recommend one training method over another for the community. Most studies incorporated a combination of theory and practice in training which reflects the current UK paramedic training. Although a vast range of methods is available, the interaction of paramedics with other community services remains the most promising means of reducing demand on EDs based on the findings of one systematic review (Evans et al., 2013).

Also, a low-quality systematic review showed that training that is practical, repeated and workplace-based over a period of weeks or months is associated with better outcomes (Byrne et al., 2008). Another systematic review reported that multifaceted programs are associated with a higher probability of a successful reduction in delay to thrombolysis therapy (Kwan et al., 2004).

Table 2 **Key findings** from systematic reviews and single studies

Category of finding	Element 2
Benefits	**Improve the BLS system**
	1 systematic review revealed that BLS is a suitable type of intervention for patients with penetrating injuries (Ryynänen et al., 2010).
	1 systematic review found that BLS defibrillation can reduce the relative risk of death for out-of-hospital cardiac arrest victims in ventricular fibrillation (Auble et al., 1995).
	1 systematic review and meta-analysis proved that a greater survival after sudden cardiac arrest is associated with the provision of bystander CPR and early defibrillation (Nichol et al., 1999; Auble et al., 1995).
	1 systematic review proved BLS defibrillation can reduce the relative risk of death for out-of-hospital cardiac arrest victims in ventricular fibrillation (Auble et al., 1995).

Category of finding	Element 2
	1 systematic review proved that the Medical Priority Dispatch System exhibits at least moderate sensitivity and specificity for detecting high acuity of illness or injury (Chad & Schwartz, 2006) 2 systematic reviews and 1 meta-analysis showed that pre-hospital BLS CPAP appears to reduce mortality and intubation rate in acute respiratory failure (Goodacre et al., 2014; Williams et al., 2013; Jensen et al., 2010) 2 systematic reviews ensure that dispatch-assisted CPR improves the bystander CPR rates, recommended to be applied for victims with symptoms of cardiac arrest (Bohm et al., 2011; Sasson et al., 2010) 3 single studies show that training paramedics in basic life- saving skills improve patients' outcomes (Arreola-Risa et al., 2000; Ali et al., 1997; Ali et al., 1998). **Integrate ALS** 5 systematic reviews and 2 meta-analyses indicated that ALS including Ultrasound, 12 Lead ECGs, intubation (in non-trauma patients) ensures early diagnosis and provides the pre-hospital physician with the knowledge to prioritize the relevant initial and improving transportation especially in rural and improves triage (Pickering et al., 2015; Lidal et al., 2013; Jørgensen et al., 2010; Brainard et al., 2005; Ioannidis et al., 2001; McDonald & Verbeek, 2006). 1 systematic reviews proved that ALS care in non-trauma cardiac arrest patients increases the probability of survival at hospital discharge almost by 47% than BLS care and it is two folded higher when given by physicians (Bakalos et al., 2011). 4 systematic reviews found that ALS also improves transportation especially in rural areas, which consequently improves triage (Jørgensen et al., 2010; McDonald & Verbeek, 2006; Brainard et al., 2005; Ioannidis et al., 2001). 2 systematic reviews and one meta-analysis showed that prehospital continuous positive airway pressure (CPAP) appears to reduce mortality and intubation rate in acute respiratory failure (Goodacre et al., 2014; Williams et al., 2013; Jensen et al., 2010). 1 systematic review showed that ALS is proper for patients with respiratory distress, epileptic seizures, simple head injury or

Category of finding	Element 2
	multiple injuries. ALS also increases survival of patients with myocardial infarction (Ryynänen et al., 2010). 1 systematic review found that for non-trauma cardiac arrest patients, ALS increases the probability of survival at hospital discharge almost by 47% than BLS care and it is two folded higher when given by physician (Bakalos et al, 2011). **Implement triage** 1 medium quality systematic review showed that two high-quality studies included in the review support the association between criteria-based dispatch (CBD) or priority pre-hospital dispatch and patient clinical outcome while two other studies showed a link between CBD and improved ambulance utilization (Wilson et al., 2002). **Employ certified EMS technicians** 2 studies showed that paramedic practitioners' schemes are associated with higher patient satisfaction (Cooper & Grant, 2009; Mason et al., 2007). 1 study showed that employing paramedics is clinically effective for elderly with acute minor conditions (Mason et al., 2007). A review of literature mentioned that in the short term the importance of having people specialized (education and training) in paramedics is to appropriately identify and manage a far wider range of commonly occurring conditions, minor illnesses, and trauma. However, in the longer term, paramedics learn to work together to take ownership of the basic philosophies of their practice to form foundations in valid and reliable research (Ball, 2005). 1 systematic review and meta-analysis showed that new pre-hospital practitioners (NPP) schemes reduced transport to the ED (Tohira et al., 2013). **Improve training** 4 systematic reviews and four meta-analyses showed that the use of technology-enhanced simulation training improves the CPR knowledge and skills for the paramedics team and also moderately improves patient outcomes (e.g. group dynamics, integrated feedback, design features of booster practice) (Cook et al., 2012; Cook et al., 2011; Ilgen et al., 2013; Mundell et al., 2013). A single study mentioned the importance of providing cadaveric training to undergraduate paramedic students which demonstrated

Category of finding	Element 2
	significant improvements in knowledge, interventional skill and attitudes for the participating students (Lim et al., 2014). 1 study in northern Iraq and Cambodia evaluated a program designed to train a core group of paramedics; these paramedics then trained thousands of laypeople to act as first responders. The study demonstrated a significant reduction in mortality from injury among populations with a high prevalence of injury (Husum et al., 2003). 1 systematic review found that simulation-based patient safety training proved to be an effective intervention to improve patient safety culture and safe medical practice in the ED. These findings correspond with the literature on medical education and training. Simulation-based training is increasingly valued as an effective method to enhance safety knowledge and behavior of providers and healthcare teams, in addition to didactic education methods. In a controlled setting, care providers can experience infrequent and unexpected events, and learn to practice resilient behavior. This is especially important in a high-risk sector such as emergency care (Hesselink et al., 2016). 1 systematic review also found that simulation-based training has a significant effect on learning of the multi-professional trauma team in non-technical skills by significantly increasing clinical team performance. However, no effect on patient outcome was found (Gjeraa et al., 2014). **Improve education** An integrative review of literature mentioned that due to the decreased global resources, shortage of skilled health workers, and the growing burden of disease in many low- and middle- income countries, there is a need to maximize the effectiveness and efficiency of pre-service education (Johnson et al., 2013). **Conduct national based community training** 1 systematic review in low- and middle-income countries found that trauma training for the layperson is successful in the sense that layperson is responsive to post implementation evaluation, such training also help identify and maximize existing resources and adapt them to learners with little formal education. In areas that are short on resource educational platforms that leverage technology to deliver content may facilitate first-responder trauma education. Themes identified can inform the development of trauma systems of care to decrease mortality and physiological severity scores in

Category of finding	Element 2
	trauma patients in Low-Middle Income Countries (LMICs) (Callese et al., 2014). 1 systematic review found that resuscitation training in developing countries was well received and viewed as valuable training by the students and local counterparts. Important student, training environment characteristics, educational outcomes and patient outcomes were inconsistently defined and reported. Institution of training in trauma and newborn resuscitation in developing countries has significantly reduced mortality, but this has not been demonstrated with other training programs (Meaney et al., 2010) 1 meta-analysis and 2 systematic reviews proved that time to defibrillation decreased and survival from out-of-hospital cardiac arrests increased with the implementation of police-AED programs (Husain & Eisenberg, 2013), early bystander CPR (Stipulante et al., 2014) and CPR and AED training for children (Plant & Taylor, 2013). 1 systematic review on the most powerful interventions to increase the bystander CPR rates found the most effective way is 9-1-1 dispatch-assisted CPR instructions, second is teaching CPR to family members of cardiac patients, third Braslow's self-training video, fourth maximizing time spent using manikins, fifth teaching the concepts of ambiguity and diffusion of responsibility. And other recommendations not supported by evidence include mass training events, pulse taking prior to CPR by laymen and CPR using chest compressions alone (Vaillancourt et al., 2008). 1 systematic review on the use of mass media campaigns for public education found that it is effective in reducing pre-hospital delay time. Interventions that used media campaigns attempted to expose the public to their message through advertising, written material or public education forums and all stressed the importance of seeking assistance rapidly. They also focus on the recognition of heart warning symptoms. However, the study also found that education through mass media makes it difficult for the public to discern for whom the messages are intended. The message itself and the means by which it is conveyed should, therefore, be appropriately tailored and targeted at those at greatest risk and at the people on whom they are likely to call when symptoms arise (Mooney et al., 2012). 1 study found the importance of interventions that focus on public awareness campaigns regarding the importance of initiating bystander CPR while activating emergency medical services (EMS) and on making CPR training more available in Lebanon (Shams et. al 2016).

Category of finding	Element 2
	1 study conducted in a village have demonstrated that lay people trained in first aid can effectively respond to emergencies in a community with a high trauma burden building a sustainable rural system (Husum et al., 2009).
	1 study showed that mobile phone positioning system to dispatch lay volunteers who were trained in CPR was associated with significantly increased rates of bystander-initiated CPR among persons with out-of-hospital cardiac arrest (Ringh et al., 2015)
	1 study showed that encouraging a technique that is easier to perform and more acceptable to the public may have helped increase the CPR rate independent of the public education efforts. Ultimately, the study suspects that only the combination of a local, state, and national public education campaign and the endorsement of compression- only CPR made this effort successful. The Hands-Only CPR campaign now being led by the American Heart Association across the nation is timely and has the potential to increase the likelihood of success in other settings (Bobrow et al., 2010).
	1 study proved that laypersons exposed to an ultra-brief AHA Hands-Only CPR video were more likely to attempt Hands-Only CPR and showed superior skills compared to untrained laypersons. This method of public education holds promise for increasing bystander Hands-Only CPR rates and survival from out- of- hospital cardiac arrest (OHCA) (Bobrow et al., 2011).
	1 study showed that diffuse implementation of AEDs fully operated by trained volunteers and laypersons within a broad and unselected environment proved safe and was associated with a significantly higher long-term survival of cardiac arrest victims (Cappato et al., 2006).
	1 single study mentioned that the National Trauma Management Course in India which was taught by local trainers became a national training standard for immediate trauma care in India after showing effective and significant impact on patients' health (Joshipura et al., 2003).
	1 study found that enforcing the training on basic life support mainly in schools and universities ensures high coverage, rapid CPR initiation, automatic external high-quality CPR, and rapid transport of patient to proper hospital (Hostler et al. 2010)
	1 study proved the importance of interventions that focus on public awareness campaigns regarding the importance of initiating

Category of finding	Element 2
	bystander CPR while activating EMS and on making CPR training more available in Lebanon (Shams et. al 2016).
Potential harms	**Integrate ALS** 4 systematic review demonstrated harm in the usage of ALS due to time delay (Goodacre et al., 2014; Jørgensen et al., 2010; Liberman et al., 2004; Williams et al., 2013) 1 study found that ALS increases pre-hospital time and thus reduces survival (Stockinger et al., 2004). **Implement triage** 1 study stated that there are concerns in regards to the safety of triaging some patients who call the dispatch center and further research is needed to evaluate such triage systems (Schmidt et al., 2004). 1 medium quality systematic review revealed that the lack of consistency between pre-hospital and hospital triage criteria specific for children with severe injuries results in secondary transfer, missed injuries and poor use of resources (McCarthy, Curtis, & Holland, 2016). **Employ certified EMTs** 1 systematic review did not support the use of new prehospital practitioners (NPP) as a scheme for patient safety as it was under-reported by most studies (Tohira et al., 2013) Conduct national based community training A study suggested the causes for the low CPR rates include fear of causing harm, fear of contracting an infectious disease, the complexity of the psychomotor task, panic, and reluctance to make mouth-to-mouth contact. Because of these and other factors, increasing bystander CPR rates has been difficult in most settings (Bobrow et al., 2010).
Cost and/ or cost effectiveness in relation to the status quo	**Improve the BLS system** A study assessing the cost effectiveness and benefits associated with improving training for pre-hospital care in Mexico sheds light on the cost-effectiveness of basic training as compared to the more expensive ALS training when trying to improve EMS (Arreola-Risa et al., 2004). **Integrate ALS**

Category of finding	Element 2
	2 systematic reviews and one study found ALS to be cost effective. The first systematic review assessed the effectiveness of Helicopter emergency medical services (HEMS) (Taylor et al., 2010). The second assessed pre-hospital telemedicine electrocardiogram triage as part of ALS for a regional public emergency (Brunetti 2014). While the study showed that based on a one-year benefit-cost analysis, pre-hospital treatment of acute stroke is highly cost-effective across a wide range of possible scenarios (Dietrich et al., 2014). 2 systematic review translated evidence on financial stresses and mismatching of resources in LMIC are common and uncertain for using ALS (Callese et al., 2015; Pandor et al., 2015). 1 study on cost-effectiveness of advanced emergency transportation showed uncertain results and recommended basic transport rather than expensive means such as helicopters (Taylor et al., 2010). **Implement triage** A cost analysis study of pre-hospital triage with telemedicine electrocardiogram (ECG) in the case of suspected acute cardiac disease concluded that this method might potentially reduce healthcare costs with a cost per quality-adjusted life year gained (QALYS) of €1927 (Brunetti et al., 2014). **Employ certified EMTs** 4 studies represented weak evidence on the savings associated with treating a patient by paramedic practitioners as compared to standard hospital respondents (USD 55 to USD 65 per patient) (Cooper & Grant, 2009; Dixon et al., 2009; Mason et al., 2007; O'Meara, 2003). **Improve training** 1 study found that there was no estimation of cost-effectiveness (cost/life saved) of the resuscitation training in developing countries (Meaney et al., 2010). 2 studies on pre-hospital personnel proved significant cost–benefit from training escorts who transport children with significant head injuries to tertiary care (Macnab et al., 2001) and the importance of assuring uniform, basic training for all pre-hospital providers which is a more cost-effective approach than is higher-cost ALS training for improving pre-hospital trauma care in Latin America (Arreola-Risa et al., 2004). **Conduct national based community training**

Category of finding	Element 2
	Training unselected laypersons in CPR/defibrillation is costly compared with other public health initiatives. Conversely, training laypersons selected by occupation, low training costs, or having high-risk household companions is substantially more efficient (Groeneveld & Owens, 2005). Training and equipping lay volunteers to defibrillate in public places may have an incremental cost-effectiveness that is similar to that of other common health interventions.(Nichol et al., 2009). The cost per QALY calculated for public place defibrillators represents poorer value for money than some alternative strategies for improving survival after prehospital cardiopulmonary arrest, such as the use of other trained first responders. The figure exceeds the commonly discussed cut off levels for funding in the the United Kingdom and United States of £30 000 and $50 000 per QALY, respectively(Walker et al., 2003). 1 cost effectiveness study showed that placing AEDs in long-term care facilities is cost-effective at $87,837 per life saved, if a hospital discharge survival rate of 25% of patients in VF can be achieved (Foutz & Sayre, 2000). 1 study on the National PAD programs involving widespread deployment of static AEDs was found to unlikely be cost-effective. To improve cost-effectiveness any prospective programs should target locations with the highest incidence of OHCA and be supported by efforts to increase AED utilization, such as improving public awareness, increasing CPR and AED training, and establishing an EMS-linked AED register (Moran et al., 2015) 1 study found that enforcing the training on basic life support mainly in schools and universities as it was proven to be a cost-effective approach in which schools and universities pay for the training and AED (Plant & Taylor 2013).
Uncertainty regarding benefits and potential harms (so monitoring and evaluation could be warranted if the approach element were pursued)	**Improve the BLS system** 2 systematic reviews translated little evidence to support the effect of the prioritization of emergency ambulances on patient outcome and dispatch-assisted CPR instruction to the survival rate (Bohm et al., 2011; Wilson et al., 2002). 2 systematic reviews translated little evidence to support the effect of the prioritization of emergency ambulances on patient outcome and dispatch-assisted CPR instruction to the survival rate (Bohm et al., 2011; Wilson et al., 2002).

Category of finding	Element 2
	1 systematic review identified many viable extra skills for paramedics but the evidence is not strong enough to guide policy (Evans et al., 2013). **Integrate ALS** 6 systematic reviews and 3 meta-analysis proved that ALS is not associated with a reduction in mortality in trauma patients and are not effective interventions to improve EMS (Pandor et al., 2015; Jayaraman et al., 2014; Bakalos et al., 2011; Bøtker et al., 2009; McDonald & Verbeek, 2006; Sherbino et al., 2006; Brainard et al., 2005; Liberman et al., 2004; Liberman et al., 2000). 5 systematic reviews found limited evidence on the effectiveness of ALS pre-hospital including advanced airway technique, ECG, early defibrillation, CPAP (Pandor et al., 2015; Hubble et al., 2010; Ioannidis et al., 2001; Brown & Galloway, 2000). 3 systematic reviews found uncertainty in the application of ALS techniques. 1 systematic review showed uncertainty in the increase of survival rate for trauma patient when ALS is applied (Bakalos et al., 2011). 1 systematic review on the effectiveness of pre-hospital BiPAP is uncertain of its impact on EMS(Goodacre et al., 2014). 1 systematic review in uncertain of the efficacy of pre-hospital Transcutaneous cardiac pacing (Sherbino et al., 2006). 1 meta-analysis showed that the aggregated data in the literature have failed to demonstrate a benefit for on-site ALS provided to trauma patients and support the scoop and run approach (Liberman et al., 2000). 1 systematic review stated that further studies are required to determine whether pre-hospital 12-lead ECG recording is effective in the contemporary setting (Brown & Galloway, 2000) and 1 systematic review stated that more research is required to evaluate the relative benefit of early defibrillation versus early ALS (Nichol et al., 1999). 1 study on the metropolitan EMS in Asia confers that the implementation of ALS services improved the intermediate, but not the final outcomes of survival (Ma et al., 2007). **Implement triage**

Category of finding	Element 2
	2 systematic review gave weak evidence on the improvement of onsite triage and prior ED notification (Pickering et al., 2015; Lidal et al., 2013)
	1 systematic review proved that in the case of mass casualties, ultrasound could aid the physician in the field to make the most appropriate triage but needs further investigation (Jørgensen et al., 2010).
	1 systematic review pointed out that there is a lack of scientific documentation evaluating the following: whether pre-hospital triage systems are effective, if one triage system is more effective than others, and the effectiveness of using the same triage system in two or more settings of an EMS in terms of: health outcomes, patient safety and satisfaction, user-friendliness, resource use, goal achievement, and quality of information flow between the different EMS settings (Lidal et al., 2013).
	1 high-quality systematic review and meta-analysis concluded that evidence is limited on the effectiveness of the transportation of patients with ST-elevation myocardial infarction (STMI) to a specialized center for percutaneous coronary intervention (PCI) in comparison with a nearby hospital (Brooks et al., 2009).
	1 study stated that there are concerns in regards to the safety of triaging some patients who call the dispatch center and further research is needed to evaluate such triage systems (Schmidt et al., 2004).
	1 medium quality integrative review revealed that the lack of consistency between pre-hospital and hospital triage criteria specific for children with severe injuries resulted in secondary transfer, missed injuries and poor use of resources (McCarthy et al., 2016).
	5 systematic reviews gave weak evidence on the improvement of onsite triage and prior ED notification (Pickering et al., 2015; Lidal et al., 2013; Jørgensen et al., 2010; McDonald & Verbeek, 2006; Bryden et al., 1999).
	1 systematic review proved that secondary triage is safe for low acuity patients. Yet, the evidence is still limited on the most suitable structure of secondary triage and its effects on ambulance demand (Eastwood et al., 2015).
	Employ certified EMTs
	1 Meta-analysis and 1 systematic review translated weak evidence on the effectiveness of the new prehospital practitioners (NPP) on

Category of finding	Element 2
	ambulance transportation to the emergency department (Bigham et al., 2013; Tohira et al., 2013). 1 medium quality systematic review proved that pre-hospital critical care delivered by paramedics is linked to little evidence (Vopelius-Feldt et al., 2013). 1 high-quality meta-analysis found insufficient evidence to support paramedic determinations of medical necessity for ambulance transport. The evidence examining this issue is weak; few studies report complete data, and the results vary greatly. While it is possible that paramedics can safely and accurately make such determinations, this ability has not been demonstrated through research (Brown et al., 2009). 3 systematic reviews demonstrated that further research is required to fully understand how expanding paramedic roles and implementing training interventions affect patients, communities, and health systems (Bigham et al., 2013; Black & Brocklehurst, 2003) and improve knowledge and skills in disaster events (Williams et al., 2008). 1 systematic review and meta-analysis translated weak evidence on the effectiveness of the NPP in regards to ambulance transportation to the ED (Tohira et al., 2013). 1 study reflected on the need for further research to better understand and support the patient safety, clinical practice, professional role and financial implications of these new roles (Cooper & Grant, 2009). **Improve training** 1 systematic review showed inconclusive evidence that Advanced Trauma Life Support (ATLS) training (or similar) impacts the outcome for victims of trauma, although there is some evidence that educational initiatives improve knowledge of what to do in emergency situations. Further, there is no evidence that trauma management systems that incorporate ATLS training positively impact outcomes (Sethi et al., 2009). 2 systematic reviews indicated that there is no benefit of advanced life support training for ambulance crews on patient outcomes (Jayaraman & Sethi, 2010; Jayaraman & Sethi, 2009). A systematic review stated that the available evidence is insufficient to determine whether training interventions and skills in disaster response for health care providers are effective in improving knowledge (Williams et al., 2008).

Category of finding	Element 2
	Training courses such as Primary Trauma Care and Advanced Life Support in Obstetrics are used to standardize protocol-based emergency care but evaluations of their outcomes and effectiveness are still pending (Kobusingye et al., 2005).
	Improve education
	A systematic review identified a lack of evidence supporting the role of primary educated dispatch models in targeting the deployment of Enhanced Care Teams to patients with severe injuries (McQueen et al., 2015).
	Conduct national based community training
	2 systematic reviews stated weak evidence on one community training method over another but it is rather a combination of theory and practical training which reflects current UK paramedic training with a vast range of methods. The reviews identified the interaction of paramedics with other community services as the most promising means for reducing demand on EDs (Evans et al., 2013; Brown et al., 2009).
	1 systematic review showed that parents of high-risk cardiac patients are willing and capable of learning BLS-related skills yet there is little evidence on the effectiveness of providing BLS training for this group (Cartledge, Bray, Leary, Stub, & Finn, 2016).

Element 3

Increase the financing of EMS through various methodologies

The expense of EMS systems is determined by equipment acquisition and maintenance, communications systems, personnel and their education, medical direction, licensing and regulation activities. Most importantly, however, is the staff level of preparedness, readiness, and response to the scene that predominantly determines system cost (Delbridge, 2002).

Over the last decade, there have been recommendations to move ambulance financing to more of a readiness-based model rather than principally based on transports (Cecchine, 2004). According to the Institutes of Medicine, "EMS costs include the direct costs of each emergency response, as well as the readiness costs associated with maintaining the capability to respond quickly, 24-hours a day, 7-days a week." Those costs include staffing levels based on call demand experience, response time reliability, level of service provided, competency training, costs of equipment and supplies, as well as administrative

expenses. These costs are inherent in the delivery of service and must be adequately accounted for in the reimbursement models (Institute of Medicine Committee on the Future of Emergency Care, 2006).

A new national initiative may help address EMS issues and stimulate the development of EMS as a system beyond its current fragmented state. For instance, sharing emergency medical technicians (EMTs) working and volunteering for a number of different providers, countywide EMS councils, and the development of network models that encourage the sharing of training resources, billing, administrative functions, and expertise (Knott, 2003). A study for the National Emergency Health Policy stated that financing policies should be designed at gradual phases for the implementation of financial schemes. As such, the study found that an effective policy for EMS financial reform can start from designing methods of cost recovery and community financing through appropriate user fees and revolving fund at all levels at first, then move to devising cost sharing methods between the federal, state, and local governments, seeking for private sector involvement and funding, and finally collaborating with the WHO, World Bank and USAID for the technical and financial support (Aliyu, 2002).

Many examples of EMS funding mechanisms are available. For instance in Oman, the EMS system is a national one funded totally by the Royal Oman Police. The service is provided free of charge for all users regardless of their ownership of health insurance. The system is 100% funded by the government as well as continuous development and improvement to the EMS system and the cost is covered fully by the government (Al-Shaqsi, 2009). In China, the pre-hospital emergency services consist of pre-hospital care and ambulance services. These are funded primarily by provincial and city bureaus of public health. This locally sourced method of funding often leads to more rural areas being unable to meet the Chinese regulatory standards due to the costs for construction and equipment acquisition (Hung et al., 2009). Another example is the government funded EMS in Greece that is provided free for all citizens (Papaspyrou et al., 2004). In Lithuania, the health care system is divided into three political and administrative levels: National Health, County Health, and Municipal Health. Its emergency care is free which is financed from Compulsory Health Insurance Fund and by the government for citizens without health insurance. A study stated that an emergency medical care initiative was proposed by an increase in the percentage of taxation on phone calls to improve the financial support for EMS (Hamad & Medlin, 2004).

Several methodologies are utilized to finance EMS. Pay for performance (P4P) is one method. Report from the Mackinac Center for Public Policy stated that contracts between municipalities and private EMS providers are moving to a performance-based model that ties funding, payment and resource allocation to the performance of the providers (Johnson, 2002).

Other methods include taxation and earmarking. Seven studies mentioned that general taxation is used in countries where EMS is public and

provided by the government (Nielsen, 2012; Al-Shaqsi 2009; Hung, 2009; Vaitkaitis, 2008; Papaspyrou et al., 2004; Hamad & Medlin, 2004; Delbridge, 2002). The 2012 U.S. Fire Administration report states several taxation methods employed in the USA to fund EMS agencies. Such as Local Property Taxes, which are the most common taxes supporting EMS services nationally. An earmarked tax for EMS is done in the state of Washington, there are complex rules earmarking parts of the basic property tax. Other types of taxes that fund EMS are: 1) Local Sales Taxes on various classes of goods and services sold in the community, 2) Real Estate Transfer Taxes that are used in areas with high single-family dwelling ownership, 3) Special Taxes, 4) Fire Flow Tax (U.S. Fire Administration, 2012).

Fee-for-service is used In the USA to finance more than three-fourths of EMS the service given is transportation but not necessarily medical care (Munjal, 2013).

Community loan is another financing model for EMS service, which is widely used and was found by two systematic reviews and two studies to be effective specifically in Africa (Elmusharaf, 2015; Nwolise et al., 2015, Kobusingye et al., 2006; Ensor & Cooper 2004). Community loan funds cover transportation and other requirements for emergencies, especially for obstetrics. Early experience indicates that this approach may overcome some of the barriers to accessing emergency medical services (Kobusingye et al., 2006).

Three studies mentioned privatizing EMS providers (Blackstone et al., 2007; Reason Foundation, 2006, Johnson, 2002). In Pinellas County, Florida, a private company "Sun-star" won the contract over a government provider to handle the emergency and non-emergency ambulance services. It has cut emergency response time by 30 seconds and advanced the equipment (Reason Foundation, 2006). Hybrid private/public approach is being used in some cities, with evidence of success. Chicago and Los Angeles, for instance, use private EMS providers who work in conjunction with fire departments to assure more rapid response times and lower per-capita EMS costs. In addition, private ambulance firms have more sophisticated equipment than public providers (Johnson, 2002).

Table 3 **Key findings from systematic reviews and primary studies**

Category of finding	Element 3
Benefits	**Pay for Performance** Two studies found that P4P is effective in incentivizing EMS agencies and paramedics, it was found to improve the performance and data collection methods of agencies (Lagarde & Palmer, 2009; Whyte & Ansley, 2008). According to one of the studies evaluating the effect of a system of financial reward for emergency medical technicians (EMTs) who meet selected quality marker goals, financial incentives such as P4P can be effective in improving pre-hospital quality markers. Employing P4P based on response time of paramedics enhanced the

Category of finding	Element 3
	practices of EMS personnel. Following the incentive, reports were completed within three hours 99.7% of the time instead of 64% as prior to the incentive. ECG performance improved from 43% to 87.8%. Documentation of the time of onset of symptoms in stroke patients improved from 97% to 100%, and the assessment of and intervention for pain in traumatic hip pain patients improved from 56% to 100% (Whyte & Ansley, 2008). **Taxation and earmarking** Earmarked property tax generates revenues dedicated solely to EMS, and the amount raised automatically increases with inflation of property values, as new assessments are made (U.S. Fire Administration, 2012). **Community loan** Two systematic reviews and two studies found community loans to be effective specifically in Africa (Elmusharaf, 2015; Nwolise et al., 2015, Kobusingye et al., 2006; Ensor & Cooper 2004). A systematic review stated that community-based loans to provide emergency transport as part of a multifaceted intervention have positive effects on increasing utilization of health facilities and potentially reduce maternal mortality. These community-based loans provide funding at the community level to make available emergency transport and offset transport fees (Elmusharaf, 2015). The Prevention of Maternal Mortality (PMM) research program in selected African countries has found that interventions such as community loan funds in Sera Leon are financed by a community tax that can be used to pay for transport and other costs of emergency care (Ensor & Cooper 2004). Another systematic review suggested that community-based loan funds as part of a multifaceted intervention have positive effects (Nwolise et al., 2015). **Privatizing EMS providers** Increase competition between public and private agencies and thus improve services (Blackstone et al., 2007; Reason Foundation, 2006, Johnson, 2002). A study concluded that private companies perform at a faster response time (Blackstone et al., 2007). A study comparing private and public providers found that a total of 70% of private providers have defibrillation devices for heart attacks compared to only 48% of public ambulances. Further, 48% of ambulance companies use automatic vehicle locators compared to 20% of city agencies (Johnson, 2002).

Category of finding	Element 3
Potential harms	**Pay for Performance** The government capacity to manage the contract for P4P may be challenging the success of contracting out strategies. The broader the services contracted, the harder it will be to define a contract precisely (Palmer 2003; Strong 2005). Another Cochrane based review of evidence showed that contract specification for pay for performance when it is incomplete, monitoring is likely to be difficult. Weak capacity within the government might, therefore, compromise the successful implementation of contracting out strategies such P4. The complexity of the contracting out intervention, therefore, makes it virtually impossible to link its possible effectiveness to one single incentive mechanism (Lagarde & Palmer, 2009). **Fee for Service** A study in the US showed that current Medicare reimbursement policies for out of hospital care link payment cost to the emergency department. This provides disincentives to the EMS agencies to work in order to reduce costs which limit their work and their role in the US (Munjal & Carr 2013). **Community Loans** Community loans to improve maternal mortality during emergencies are usually projects that do not communicate with other stakeholders, bypassing the government, and using standardized, inflexible models. Politicians, policy makers, health authorities, providers and target populations do not generally communicate with each other before developing maternal health programs. Likewise, programs designers do not normally take into consideration the socioeconomic, cultural, political and other sensitive factors within the community when designing or implementing their programs (Kante, 2010). **Privatizing EMS Providers** A study showed that maintaining the contract for private providers requires meeting performance targets like response time. This solution introduces competition in price setting at bidding time. However, the possible lack of a sufficient number of companies bidding for the service and the granting of monopolistic power for the contract term raises some troublesome issues (Blackstone et al., 2007).
Cost and/ or cost	**Privatizing EMS providers**

Category of finding	Element 3
effectiveness in relation to the status quo	3 studies found that privatizing EMS providers increases competition between public and private agencies and thus reduces the cost of service (Blackstone et al., 2007; Reason Foundation, 2006, Johnson, 2002). A study found that privatizing EMS providers It is predictable to save between $13 and $21 million over the decade (Reason Foundation, 2006). A study comparing private to public ambulance service concluded that private companies perform at lower cost (Blackstone et al., 2007).
Uncertainty regarding benefits and potential harms (so monitoring and evaluation could be warranted if the approach element were pursued)	**Pay for Performance** According to one systematic review and one primary study on the use of P4P to finance EMS, evidence on its efficiency is scarce and inconclusive (Eijkenaar, 2013; Emmert et al., 2012). One study suggested that to conduct successful implementation of P4P, the purchaser should make more efforts such as increasing providers' level of awareness about P4P, providing technical and educational support, reducing their burden, developing a cooperative relationship with providers, developing more accurate quality measures, and minimizing the unintended consequences (Lee et al., 2012). A systematic review on performance-based funding showed that it is not a uniform intervention, but rather a range of approaches. Its effects depend on the interaction of several variables, including the design of the intervention, the amount of additional funding, other ancillary components such as technical support, and contextual factors, including the organizational context in which it is implemented (Witter et al., 2012). **Taxation and earmarking** Taxation usually requires going to the voters to authorize starting the tax and again to continue it after a specified period. It can only be used up to a specified limit. In addition, tax funds automatically decrease when property assessments decline (U.S. Fire Administration, 2012). **Privatizing EMS providers** A study found that private paramedics earn only 75% of what their public counterparts earn, making it difficult to retain EMS personnel (Johnson, 2002).

Implementation considerations

Barriers to implementation are at the patient, professional, organizational and system levels. Counterstrategies are proposed at each level.

	Barriers	Counterstrategies
Patient	Patients are not aware how to activate the EMS system in case of emergency (El Sayed et al., 2014a). Patients prefer a physician to perform procedures on them rather than EMS personnel.	Invest in patient education on EMS role, while increasing their awareness about other diseases or critical cases symptoms and how to react accordingly (El Sayed & Bayram, 2013). Promote both low- and high-intensity media campaigns to increased community awareness of stroke warning signs and increased emergency department presentation of stroke patients associated with public education (Silver, 2003; Hodgson, 2007).
Community	Lay people lack knowledge and skills in managing emergency situations generally and injured victims particularly (Pallavisarji et al., 2013). Lay people are not well trained in CPR, lack the confidence to perform it and fear legal complications that might follow their intervention (Shams et al., 2016; Pallavisarji et al., 2013). Training unselected laypersons in CPR/defibrillation is costly (Groeneveld et al., 2005).	Design national campaigns, an action plan in order to create a culture of personnel preparedness and an emergency resilient communities (Groves, 2013). Increase awareness and training of lay people on how to perform CPR (Kuramoto et al., 2008). Public health policy makers should prioritize bystanders CPR and rapid defibrillation response while planning for resources allocation (Stiell, 2007) including public access defibrillator deployment Provide CPR training to selected occupational workers or people having a high risk of encountering cardiac arrest cases in their environment. Tailor trainings according to each target group mainly low cost and short duration trainings possibly through the internet or videos for unselected laypersons and a more hands-on training with emphasis on skill acquisition and

	Barriers	Counterstrategies
		retention on resuscitation for the other at risk group (Groeneveld & Owens 2005).
Professional	The implementation of an accreditation system may create a skeptic attitude from professionals who will resist its implementation due to lack of time, knowledge and financial incentives as well as a reluctance to change practice (Brusamento et al., 2012; Alkhenizan & Shaw, 2011).	The implementation of an accreditation system should be followed by an education of the healthcare professionals on the importance of the system (Alkhenizan & Shaw, 2011) In Lebanon registries for emergency, responses can be implemented and directly monitored by the MoPH similar to the mortality online registries newly implemented in hospitals to collect data.
Organizational	Financial stresses and mismatching of resources may be encountered when enhancing EMS system, such as when improving or implementing BLS or ALS (Callese, 2015). Raising the response rate to meet needs of all patients may be inconvenient to EMS agencies due to lack of resources, especially that not all responses require EMS. Implementing national standards, educational and training standards require training and resources which are both timely and costly. Comprehensive statistical evaluations with digital databases and registries are limited by resources, technology, and expertise for EMS (Bayram 2007).	Larger agencies such as the LRC and the CD collaborate with the smaller agencies to provide them with the necessary standard training. Agencies can develop network models that encourage the sharing of training resources, billing, administrative functions, and expertise (Knott, 2003). Principles can be easily adopted by Lebanon and other developing countries to standardize and improve their emergency response systems using existing infrastructure (El Sayed & Bayram, 2013). EMS agencies can develop their own policies and procedures based on the state's standards, as long as they are approved by a medical director, just like the California 1797.220 law (California Legislative Information, 2016) these should be reviewed and enforced by a governing body within the MOPH responsible for the EMS system. Response rate among other indicators used by EMS agencies should be

	Barriers	Counterstrategies
		developed in a system based approach, such as Wales (UK) standards of response that include factors such as: geography, demography, transport, road and health infrastructures, which influence the amount of resource required to achieve the target in question (Welsh Ambulance Services NHS Trust, 2009) To ensure implementation of standards, just like in numerous states in the U.S., medical oversight for paramedic systems can be mandated, or each organization may be required to have a medical director. Other countries, such as in France mandate the presence of a physician on every Advanced Life Support (ALS) ambulance (SMUR) (Zeid, 2001).
System	Adopting international standards in Lebanon is complicated and challenging due to the different contexts each country has. There is no committee to audit and monitor the implementation of standards. There is no national registry to follow up on EMS and quality of care. Lebanon will face financing problems even when the budget is increased.	The choice of KPIs implemented by individual EMS systems should depend on the current clinical and strategic priorities of the specific country (Murphy, 2016). An emergency medical care committee or a governing body within the MOPH responsible for the EMS system can audit and review on a yearly basis the ambulance services, training programs and the first aid practices just like the California law 1797.274 states (California Legislative Information, 2016). The standards, protocols, and guidelines developed by the LRC based on international best practices and adapted to the Lebanese context can be referred to or adopted at the national level since they already are context specific.

Barriers	Counterstrategies
	Reduce the complexity of guideline recommendations; ensure robust and active dissemination strategies that target physician attitudes; and promote interactive educational meeting including reminders (Spallek et al., 2010; Brusamento et al., 2012). Collaborate with an academic institution and scientific societies to contextualize standards, match the local needs and develop best practices. This was previously done in Lebanon for mental health care where the MoPH developed the National Mental Health Program in 2014, which aims to reform mental health in Lebanon and is responsible for setting strategies and accreditation standards (MoPH, 2017). An example of successful international standards contextualized to match local context is the Arab Board of Emergency Medicine that was modeled after the American Board of Emergency Medicine (Arab Board, 2016) A combination of funding from the government, insurance companies, and the community should be secured in order to be able to develop and maintain a high-quality system. (Jabr, 2009).

Next Steps

Next Steps

The aim of this policy brief is to foster dialogue informed by the best available evidence. The intention is not to advocate specific policy options/elements or close off discussion. Further actions will flow from the deliberations that the policy brief is intended to inform. These may include:

- Deliberation amongst policymakers and stakeholders regarding the policy elements described in this policy brief.
- Refining elements, for example by incorporating, removing or modifying some components

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