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EDUCATION AND PRACTICE

EXPANDING PARAMEDIC SCOPE OF PRACTICE IN THE COMMUNITY: A SYSTEMATIC REVIEW OF THE LITERATURE

Blair L. Bigham, MSc, ACPf, Sioban M. Kennedy, MA, ACP, Ian Drennan, BSc, PCP, Laurie J. Morrison, MD, MSc

ABSTRACT

Background. Paramedics are an important health human resource and are uniquely mobile in most communities across Canada. In the last dozen years, challenges in the delivery of health care have prompted governments from around the globe to consider expanding the role paramedics play in health systems. Utilizing paramedics for the management of urgent, low-acuity illnesses and injuries has been coined "community paramedicine," but the role, safety, and effectiveness of this concept are poorly understood. **Objective.** We undertook a systematic review of the international literature to describe existing community paramedic programs. **Method**. We used the Cochrane methodology for systematic reviews. An international group of experts developed a search strategy and a health information specialist executed this search in Medline, Embase, and CINAHL starting January 1, 2000. We included all research articles in the English language that reported a research methodology. We excluded commentaries and letters to the editor. Two investigators independently screened citations in a hierarchical manner and abstracted data. **Results.** Of 3,089 titles, 10 articles were included in the systematic review and one additional paper was author-nominated. The nature of the 11 articles was heterogeneous, and only one randomized controlled trial (RCT) was found. This trial showed community paramedicine to be beneficial to patients and health systems. The other articles drew conclusions favoring community paramedicine. **Conclusion.** Community paramedicine research to date is lacking, but programs in the United Kingdom, Australia, and Canada are perceived to be promising, and one RCT shows that paramedics can safely practice with an expanded scope and improve system performance and patient outcomes. Further research is required to fully understand how expanding paramedic roles affect patients, communities, and health systems. **Key words**: emergency medical services; prehospital; community paramedic; extended scope; paramedic practitioner

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INTRODUCTION

Health care demand is increasing around the world as populations grow and age.[1–3] Emergency medical services (EMS) systems have been impacted by the increasing need for their services, with requests for emergency ambulances rising by as much as 8% annually.[4–6] Many of the patients for whom EMS is summoned do not require emergent interventions by prehospital care providers[6,7] and may best be served by other health services through referral by prehospital care providers.[8] However, most EMS models only allow providers to transport patients to an emergency department (ED) for physician services, although as many as 50% of patients transported to ED by EMS are discharged without significant treatment or referral.[9] Articles from the United Kingdom, Canada, and the

United States have estimated that 30% to 50% of all ambulance transports to the ED are inappropriate[5,10,11] and that some patients transported to the ED by EMS leave without ever being seen.[12] The increase in demand for emergency care has led to a suboptimal situation that is not benefiting patients, providers, or health care systems. These challenges, in addition to the longstanding difficulty of providing health care to rural communities,[3,13] have sparked calls for increased use of allied health professionals to carry out assessments and treatments traditionally delivered by physicians.[1,14–16]

Emergency ambulances are often staffed by paramedics trained to assess emergencies and treat life-threatening situations. While variable by region, paramedic scope of practice in many jurisdictions includes endotracheal intubation, needle thoracostomy, intravenous access, medication administration of antiarrhythmics, narcotics, dextrose and inotropes, and electrical therapies, including defibrillation, cardioversion, and transcutaneous pacing. In the last decade, the scope of practice of some paramedics has grown to include interventions for acute conditions such as thrombolytics in ST-segment elevation myocardial infarction (STEMI)[17] and hospital bypass for STEMI[18] and suspected ischemic stroke.[19] Other conditions, including hypoglycemia,[20] epistaxis, and falls,[21] are also being managed exclusively by paramedics and often result in no transport to an ED. In light of these advancements, several national organizations from the United Kingdom, Canada, and the United States have suggested paramedics may be able to treat patients who call EMS for minor conditions in the field or refer them to non-ED health resources.[14,16,22] This could potentially reduce EMS and ED workload, increase system capacity, improve patient satisfaction, and improve clinical outcomes. Others have suggested that health promotion and injury prevention should also be added to the paramedic scope of practice.[23–25]

Many terms have been used to describe paramedics with an expanded scope of practice, including emergency care practitioner,[26] extended skills paramedic,[27] community paramedic[28] (CP), and paramedic practitioner.[29] The International Roundtable for Community Paramedicine (IRCP) is a network of EMS leaders pursuing the concept of expanding paramedic scope; given international participation in this organization, we have adopted the term *community paramedic* when referring to the expansion of paramedic scope.

Our objective was to systematically review the international literature to identify scientific evidence for or against the use of community paramedics. This information is intended to inform physicians, EMS operators, and policymakers who design, manage, and fund EMS and health care systems.

METHODS

Data Sources and Search Strategy

We conducted a systematic review of the literature to identify scientific evidence regarding expanded paramedic scope of practice. Our process followed the Cochrane methodology.[30] We searched the Medline, Embase, and CINAHL databases from January 1, 2000, to September 30, 2011, for all relevant articles. The time period used in the search strategy was limited to after January 2000, as prior to this time the idea of community paramedicine was not clearly defined. To find all relevant citations related to community paramedicine, we used a complex set of search strategies that combined medical subject headings and text words for terms related to emergency medical services, paramedics, and community health (Appendix 1, available online). The search strategy was developed by the investigators in consultation with the Ontario Community Paramedicine Interest Group, the IRCP, and an information specialist. We identified additional articles by hand-searching bibliographies of all included articles and contacting experts in the field.

Data Selection

We included all research articles that measured a patient-related or system-related outcome related to paramedic provision of expanded scope of practice. We excluded opinion articles, commentaries, and letters to the editor, though we checked the references of such articles to ensure we had not missed eligible articles. Two investigators (BLB and SMK) reviewed all citations independently in a hierarchical manner. Titles classified as "include" or "indeterminate" by at least one of the investigators were included in the next iteration of review by abstract. The same process occurred to identify full articles for review. Disagreements at the full-article stage were resolved by consensus between two authors (BLB, SMK).

Data Extraction

Two investigators (BLB, SMK) independently abstracted the following information from each article using a data-abstraction tool: the study design, the population demographics, the control and intervention, the outcome data, the type of EMS provider, and the EMS setting involved. Any abstraction differences were resolved through consensus.

RESULTS

Search Yield

The search strategy identified 3,089 citations (Fig. 1). Of these, 448 were selected for abstract review and 105

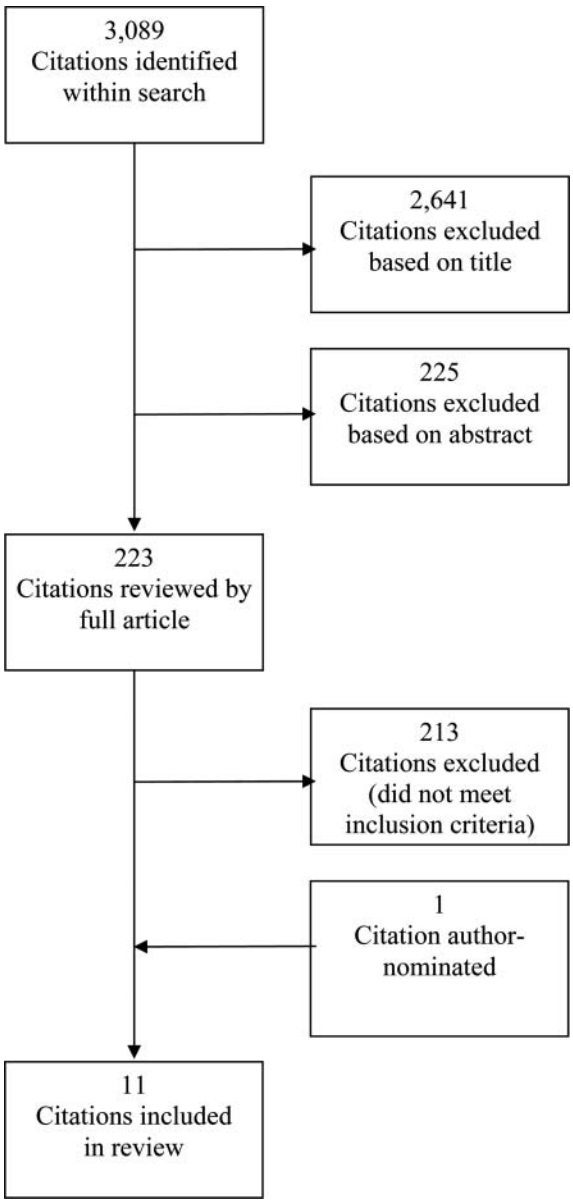

FIGURE 1. Flowchart of the review process.

of these articles had no abstract and were reviewed at the full-text stage. The remaining 343 titles that had abstracts were reviewed and of these 118 underwent full-text review. Of the 223 full-text articles reviewed, 10 articles met inclusion criteria. One additional article from a database we did not search (PsychINFO) was author-nominated; a total of 11 articles were included in our review (Table 1).[21,27,29,31–38] The kappa measuring interrater agreement for title, abstract, and full-text articles was 0.70, 0.62, and 0.90, respectively. The results from data abstraction can be found in Table 2.

Methodologies

One study was an RCT[27,29] that investigated the efficacy of community paramedicine in the United Kingdom. One other study used data from the RCT.[33] The remaining body of evidence was limited to case–control, observational, economic, and safety studies, and qualitative surveys.

Population Demographics

Nine of the articles were from the United Kingdom; Canada[35] and Australia[37] each produced one study. Reviewers determined that eight articles[27,29,31–36] quantitatively examined resource utilization with a focus on reducing ED visits. Some articles[21,27,29,31,35,37,38] qualitatively explored satisfaction with CP services with patients and paramedics. Patient groups varied; most articles included all age groups[21,31,32,34] or only elderly patients[27,29,33,38]; however, one study included only adults,[35] and one study exclusively examined pediatric patients.[36] A single study examined paramedic attitudes and satisfaction with extended paramedic training and did not focus on patient groups.[37] Provider populations varied also in terms of age, professional experience, and certifications (emergency medical technicians, paramedics, nurses).

Interventions and Scope of Practice

In all articles, the scope of community paramedicine was tailored to the needs of the local communities, whether rural or urban environments, and all CPs received additional training above and beyond the scope of practice for a locally identified paramedic. New competencies included the assessment of minor acute and chronic illnesses and injuries,[27,29,31,37] providing nontraditional pathways to facilitate further assessment, treatment, and follow-up,[32,34] and providing on-scene health promotion education and chronic illness surveillance.[38] Nontraditional pathways included protocol-driven referrals to radiography clinics, general practitioners, district nurses, and social services.[29,32] Community paramedics had enhanced skills (Table 3) that allowed them to treat patients at home with minor injuries and illnesses (Table 4) and then leave the patient at home.[27,29,37] The decisions were driven by protocols and skill development, which enabled the provider to suggest self-care, refer patients to non-ED agencies, or recommend nonambulance transport to an ED.[21,29] Additionally, CPs were utilized in dispatch centers to identify calls that met CP eligibility.[34]

Outcomes

Outcomes ranged from clinical indicators (ED attendance and length of stay)[27,29,31,32,34,35] and operational outcomes (time on task, and transport rates)[21,27,29,32,34,36] to patient satisfaction scores[21,27,29,31,35,38] and economic impacts[33,35] on health systems. Two articles

TABLE 1. Summary of the 11 Included Articles

Citation	Method	*N*	Population	Intervention	Control	Outcome
Cooper et al. (2004)[31]	Constructivist methodology	4 ECPs 11 standard paramedics	Qualitative reports on the ECP experience	ECP training	Standard paramedics	Favorable towards community paramedicine
Snooks et al. (2004)[21]	Prospective cohort study Qualitative survey	797 I: 251 C: 537 117/215	9–9–9 calls that met 24 a priori illness codes during a 4-month period	Response by paramedics trained in treat-and-refer protocols	Standard paramedic response	Favorable towards community paramedicine
Mason et al. (2007)[29]	Cluster RCT (week) Qualitative survey	3,018 I: 1,549 C: 1,469	All 9–9–9 patients >60 years of age who called EMS between 0800 and 2000 and had a problem within the scope of practice of a PP during a 56-week period	Paramedic practitioner	Standard paramedic care	Favorable towards community paramedicine
Cooper et al. (2008)[32]	Prospective cohort study	25 ECPs	25/63 extended care practitioners responded to the survey by completing 611 patient care reports	ECP training	Standard paramedic	Favorable towards community paramedicine
Gray and Walker (2008)[34]	Prospective cohort study	3,955	All ECP-indicated calls to 9–9–9 during a 12-month period	N/A	Calls where an ECP, or rarely a dispatcher, tiered ECP	Favorable towards community paramedic role in dispatch center compared with standard AMPDS dispatcher
Mason et al. (2008)[27]	Cluster RCT	2,025	All 9–9–9 patients >60 years of age who called EMS between 0800 and 2000 and had a problem within the scope of practice of a PP during a 56-week period	Paramedic practitioner	Standard paramedic care	Favorable towards community paramedicine
Reeve et al. (2008)[37]	Qualitative survey tool	16/20	Graduates of a one-year extended paramedic program	N/A	N/A	Favorable towards community paramedicine
Dixon et al. (2009)[33]	Economic analysis as part of a cluster RCT	3,018	All 9–9–9 calls that were part of a larger RCT (Mason)	Paramedic practitioner	Standard care paramedic	Community paramedicine program is cost-effective
Martin-Misener et al. (2009)[35]	Longitudinal mixed methods	$n = 86$ (year 1); $n = 85$ (year 2); $n = 50$ (year 3)	Adult English-speaking permanent residents of the geographic area, age 40 years or more with a diagnosis of at least one chronic illness	A nurse practitioner – paramedic model of health care delivery	Previous emergency paramedic care	Favorable towards community paramedic–nurse practitioner model
Shah et al. (2010)[38]	Patient screening questionnaires	9–1–1 calls $n = 1,444$ EMS screened $n = 1,231$ In-home assessment $n = 153$	9–1–1 patients between April 2006 and December 2007 >60 years of age	Paramedic referral to PCP or social services	None	Favorable towards community paramedicine
O'Keeffe et al. (2011)[36]	Quasi-experimental, non-RCT	1,153	Pediatric patients <16 years of age	ECPs	Other health Care providers (GP, NP)	No significant difference between intervention and control

C = control; ECP = extended care practitioner; EMS = emergency medical services; GP = general practitioner; I = intervention; NP = nurse practitioner; PP = paramedic practitioner; RCT = randomized controlled trial.

assessed the safety of CPs.[21,27] One study focused on the attitudes and satisfaction of paramedics with the incorporation of community health–related training.[37]

DISCUSSION

Our systematic review identified only 11 peer-reviewed articles studying community paramedicine, all of which were published in the last eight years,

TABLE 2. Data Abstraction Results

Citation	Method	*N*	Population	Intervention	Control	Outcome
Cooper et al. (2004)[31]	Constructivist methodology	4 ECPs 11 standard paramedics	Total 691 cases between October 2002 and March 2003 I: 361 C: 331 Stage 1: reflective reports and patient report forms Stage 2: focus group interviews	ECP training	Standard paramedics	28% patients treated on scene by ECPs vs. 18% by paramedics ($p = 0.007$), no patients conveyed within 24 hours 50% ECPs conveyed, vs. 64% of paramedics ($p = 0.000$) Perceived qualitative benefits: Reduction in unnecessary trips to ED Improved resource allocation Additional training improved clinical practice Practitioner and stakeholder noted benefit to patient care regarding issues around referrals and "treat and release"
Snooks et al. (2004)[21]	Prospective cohort study Qualitative survey	797 I: 251 C: 537 Ex: 9 117/215	9–9–9 calls that met 24 a priori illness codes during a 4-month period	Response by paramedics trained in treat-and-refer protocols	Standard paramedic response	Primary outcome: percentage of patients left at the scene I: 37.1%, 93/251 C: 36.3%, 195/537, $p = 0.90$ Secondary outcomes: Used protocol: 101/251 (40.2% compliance) Outside protocol: $n = 9$ Median job cycle time (all patients) I: 51 min C: 47 min, $p < 0.001$ Median job cycle for nontransports I: 35 min C: 27 min, $p \leq 0.0001$ Patient safety: Physician reviewer identified 3 patients in each cohort (no p reported) who should have been transported. No follow-up Only 2 of the 9 patients outside protocol were left at home, none deemed to require transport Survey results: Nonconveyed patients in intervention: Patient satisfaction: I: 81% C: 58%, $p < 0.05$ Right amount of advice: 69% vs. 46%, $p < 0.05$ Reassured by advice: 72% vs. 45%, $p < 0.05$ Clear advice given when to get more help: 71% vs. 46%, $p < 0.05$

TABLE 2. Data Abstraction Results

Citation	Method	*N*	Population	Intervention	Control	Outcome
Mason et al. (2007)[29]	Cluster RCT (week) Qualitative survey	3,996 I: 2,087 C: 1,909 Consent and not excluded 3,018 I: 1,549 C: 1,469	All 9–9–9 patients >60 years of age who called EMS between 0800 and 2000 and had a problem within the scope of practice of a PP during a 56-week period Age and gender between groups were similar	Paramedic practitioner (chief complaint: falls, lacerations, epistaxis, minor burns, foreign bodies. Techniques: local anesthetic, wound care, suturing, principles of dressing and splintage Advanced assessment: joint exam, ENT exam, neurologic, cardiovascular, respiratory systems Protocol-led dispensing: analgesia, antibiotics, tetanus toxoid Social needs assessment: referral to radiography, GP, district RN, community social services, ED	Standard paramedic care	ED attendance 0–28 days: I: 970/1,549, 62.6% C: 1,286/1,469, 87.5%, $p < 0.001$ Hospital admission 0–28 days: I: 626/1,549, 40.4% C: 683/1,469, 46.5%, $p < 0.001$ Very satisfied: I: 656 (85.5%) C: 528 (73.8%), $p < 0.001$ Total episode time: I: 235.1 minutes (SD 183.3) C: 277.8 minutes (SD 182.6), $p < 0.001$ Secondary: Any investigation: I: 754 (49.7%) C: 971 (67.9), $p < 0.001$ Received PP treatment: I: 1,233 (81.3%) C: 1,040 (72.8%), $p < 0.001$ Subsequent unplanned contact after initial episode: I 330 (21.3%) CC 259 (17.6%), $p < 0.01$ Physical health worsened (self-reported): I: 166 (21.7%) C: 170 (25.6%), $p = 0.13$ Mortality at 28 days: I: 68 (4.4%) C: 74 (5.0%), $p = 0.41$
Cooper et al. (2008)[32]	Prospective cohort study	25 ECPs	25/63 ECPs completed a total of 611 patient audit forms during two 3-week periods (February 2006; April/May 2006)	ECPs	Standard paramedic	40% (25/63) response rate for ECPs 40% patients >75 years of age; 18% less than 16 years old Response time for ECPs: Mean 16.5 min (SD 47.5 min); minimum 1 min; maximum 13 hours (nonurgent referral) Mean scene time: 46.5 min (SD 28.5); minimum <1 min–4.5 hours ECP diagnosis: Weak correlation between presenting condition and ECP diagnosis (Spearman's rho = 0.457, $p = 0.01$) and high correlation between ECP diagnosis and diagnosis after 24 hours (Spearman's rho = 0.731, $p = 0.01$) ECP nonconveyance rate 62% (95% CI 58%–66%), compared with 32% for paramedics in the same time period Patient referral by ECPs:

TABLE 2. Data Abstraction Results

Citation	Method	*N*	Population	Intervention	Control	Outcome
						ED: 46% (139/302) GP: 13% Minor injury units: 7% District nurses: 2% Falls groups: 1% Diagnostic predictors of transportation: Respiratory: OR 2.88 Cardiac: 10.81 Neurologic: 5.67 Trauma: 2.48 Social need: 034 ECPs reported only 5% unsatisfactory outcomes ECP-specific intervention performed on 66% of patients (396/600) which avoided acute admission
Gray and Walker (2008)[34]	Prospective cohort study	3,955	All ECP-indicated calls to 9–9–9 during a 12-month period	N/A	Calls where an ECP, or rarely a dispatcher, in the control center tiered an ECP	This study compared nontransport rates (alternative pathway) by AMPDS category AMPDS Category A (life-threatening) 36.3% alternative pathway (414/1,141) AMPDS Category B (serious) 52.2% alternative pathway (930/1,781) AMPDS Category C (other) 44.1% alternative pathway (456/1,033)
Mason et al. (2008)[27]	Cluster RCT	3,996 I: 2,087 C: 1,909 3,018 recruited into trial I: 1,549 C: 1,469 Used in analysis of safety 2,025 I: 1,118 C: 907	All 9–9–9 patients calling between 0800 and 2000 between September 1, 2003, and September 26, 2004. Patients were >60 years old with a presenting complaint within the scope of paramedic practitioner	Paramedic practitioner assessment and treatment	Standard EMS crew assessment and transport to nearest ED	Patients in intervention group were less likely to attend the ED (RR 0.72; 95% CI 0.68 to 0.75), require hospital admission within 28 days (RR 0.87; 95% CI 0.81 to 0.94), and experience shorter total episode time (235.07 min vs. 27.8 min; 95% CI of difference –59.5 to –25.0) Intervention group reported greater satisfaction with health care episode (RR 1.16; 95% CI 1.09 to 1.23) No statistically significant difference in 28-day mortality (RR 0.87; 95% CI 0.63 to 1.21) Safety analysis: Overall, 10.8% of patients (n = 2,025) had an unplanned ED visit after initial episode There was a statistically significant difference in unplanned ED visits within 7 days

TABLE 2. Data Abstraction Results

Citation	Method	*N*	Population	Intervention	Control	Outcome
						Proportion of total: (I: 11.9%; C: 9.5%, p = 0.049) Proportion of returning patients (I: 75.2%; C: 72.1%, p = 0.64) No difference in unplanned ED visits related to initial incident (I: 8.9%; C: 6.8%, p = 0.052) Overall, 42 cases noted of suboptimal care of initial episode No difference between intervention and control (26.5% vs. 27.1%, p = 0.94)
Reeve et al. (2008)[37]	Qualitative survey tool	16/20	Graduates of a one-year extended paramedic program	N/A	N/A	Self-reported attitudes towards community health were collected Learned new skills: 15/16 Likely to incorporate into practice: 16/16 Better prepared to undertake population health activities: 16/16 Involvement in health promotion and prevention increased: 13/16 Increased likelihood to stay in field: 12/16 Job satisfaction increased: 16/16 Better understanding of social determinants of health: 14/16
Dixon et al. (2009)[33]	Economic analysis as part of a cluster RCT	3,018	All 9–9–9 calls that were part of a larger RCT (Mason)	Paramedic practitioner	Standard care paramedic	Cost (prehospital costs, ED costs, inpatient costs, social care assessment, primary and community care costs, nursing residential care costs) between paramedic practitioner and standard care were compared Routine data: 140 L less, p = 0.63 Cost to train PP 73 £ Routine data + QALY + EQ-5D data: 551 L CI –1170 to 67) QALY advantage 0.001, p = 0.13 QALY is 20,000 L, PP program is 95% likely to be cost-effective
Martin-Misener et al. (2009)[35]	Longitudinal mixed methods Questionnaire	*n* = 86 (year 1); *n* = 85 (year 2); *n* = 50 (year 3) Initial *n* = 86	Adult English-speaking residents of the Islands >40 years of age, with one or more diagnosed chronic illness able to provide informed written consent	Nurse practitioner–paramedic–family physician model	Previous emergency paramedic care	Health and Social Utilization questionnaire (HSSUSQ): Mean total cost: Year 1 (baseline) = $11,345.61 Year 2: $10,521.14 Year 3: $4,706.29

TABLE 2. Data Abstraction Results

Citation	Method	*N*	Population	Intervention	Control	Outcome
						Significant differences for: mean prescription medication costs: Year 1 = $94.82; Year 2 = $84.58; Year 3 = $67.01 ($\chi^2 = 7.55$, p = 0.023) Mean travel for health care costs: Year 1 = $263.88; Year 2 = $200.18; Year 3 = $30.73 ($\chi^2 = 7.90$, p = 0.02) Psychosocial Adjustment to Illness (PAIS-SR) questionnaire: No statistically significant changes were noted in scores of health care orientation, sexual relationships, social environment, and psychological distress Total GP visits: Year 1 = 5214; Year 2 = 5,720; Year 3 = 3,759; decrease of 28% Total ED visits: Year 1 = 85; Year 2 = 96; Year 3 = 51; decrease of 40% Qualitative results from interviews: Participants reported: Increased accessibility to a range of health care services including health promotion services. Acceptance of the new model of care by residents and health care providers increased substantially over the three years Residents preferred new system to old Overall satisfaction among community residents Participants felt the health care model was well suited for rural and small population settings
Shah et al. (2010)[38]	Patient screening questionnaires	9–1–1 calls *n* = 1,444 EMS screened *n* = 1,231 In-home assessment *n* = 153	9–1–1 patients between April 2006 and December 2007 >60 years of age	Paramedic referral to PCP or social services	None	Patients successfully screened by EMS: 728 (59%) for depression 814 (66%) for fall risk 950 (77%) for medication strategies Positive screen: 240 (33%) for depression 552 (68%) for risk of falls 852 (90%) for medication management problems Of 1,231 screened, 172 accepted a follow-up home visit, 153 successfully completed the home visit

TABLE 2 Data Abstraction Results

Citation	Method	*N*	Population	Intervention	Control	Outcome
						Needs assessment from home visit: Vaccinations (12%–16%) Depression (13%) Medication management (26%) Falls (54%) Referrals and interventions: Education (16%) Social service referrals (25%) PCP referrals (52%) Patient refused referrals (6%) Follow-up interview (n = 130) 119 (92%) overall satisfaction with program
O'Keeffe et al. (2011)[36]	Pragmatic quasi-experimental trial	Total n = 1,153 Eligible for inclusion n = 1,104 (49 missing data) Intervention n = 394 Control n = 710	Patients <16 years of age. Patients presented to either urgent care center, minor injury unit, or GP outside of service hours between January and August 2007	ECPs	Other health Care providers (GP, NP)	ECP discharged significantly fewer patients (7.3% difference; 95% CI 13.6% to 0.9%) ECPs referred more patients to hospital (4.5% difference; 95% CI 2.9% to 12.0%), and to primary care, although not statistically significant (3.0% difference; 95% CI 3.7% to 9.7%) Secondary outcomes: Total episode time decreased with ECPs (time ratio 0.67; 95% CI 0.60 to 0.74) Investigations were done by fewer ECPs (6.8% difference; 95% CI 28.9% to 15.3%), although this was site-dependent ECPs provided fewer treatments than usual care providers (16.0% difference; 95% CI 33.1% to 1.1%)

AMPDS = Advanced Multiple Priority Dispatch System; C = control; CI = confidence interval; ECP = extended care practitioner; EQ-5D = EuroQol 5 domain questionnaire; Ex = excluded; I = intervention.

and representing only three countries. Of these, only one was an RCT,[27,29] with the remaining methodologies' being cohort studies and qualitative surveys. The heterogeneity of these studies makes comparison and aggregation of community paramedic evidence difficult. Populations, interventions, and outcomes were not uniformly recorded or reported, and no common mandate for community paramedicine was identified. These differences between the studies make it difficult to scientifically support community paramedicine given the current body of knowledge, despite limited evidence that patient satisfaction, health outcomes, ED utilization, and system performance improve modestly.

The impetus for community paramedicine programs in each of the three countries conducting CP research is a government-driven shift in its single-payer model of health care delivery. In each country, health system reviews have identified that the abilities of nonphysician health care providers are being underutilized; thus, each country has targeted an expanded health care role for certain providers with increased interprofessional collaboration. Examples include giving prescribing rights to pharmacists, allowing a nurse practitioner to order x-rays, and the evolving role of physician assistants.[3,16,39] Some reports have suggested that paramedics should be permitted to prescribe some antibiotics and analgesics, suture

TABLE 3. Skill Sets and Competencies of the Community Paramedics[29]

- local anesthetic techniques
- suturing techniques
- wound care
- splinter removal
- principles of dressings and splinting
- joint examinations
- neurologic, cardiovascular, respiratory system examination
- ear, nose, and throat examination
- protocol-led dispensing including
  - analgesia
  - antibiotics
  - tetanus toxoid
- mobility and social needs assessments
- requests for radiography
- referral processes, including
  - emergency department
  - general practitioner
  - district nurse
  - community social services

lacerations, and order certain radiographic tests rather than transporting nearly all 9–1–1 patients to an ED for physician assessment.[21,29,37] Paramedics often manage hypoglycemia[20,40] and opioid toxicity[41] in the field under no-transport guidelines; however, they have continued to operate mostly in isolation from the broader health system.

Carving out nontraditional roles that CPs can play in local health systems is challenging. Though our review has identified certain services that can be delivered by CPs, the role for CPs is unclear. In order to determine the role of CPs, the desired outcomes of community paramedicine programs must be established. Such outcomes may include ambulance utilization, ED attendance, visits to community health care resources, measures of morbidity and mortality, quality-of-life indicators, patient perceptions, and economic impacts. Safety outcomes must be measured. Determining these outcomes requires discussion with many disciplines, including family practitioners, ED staff, community care agencies, public health departments, and government health ministries. This collaborative discussion will lead to a clear mandate for community paramedicine. Nurse practitioners and physician assistants have done similar groundwork.

TABLE 4. Minor Illnesses and Ailments Managed by the Community Paramedics[21]

- minor allergic reaction, insect bite/sting
- boils and abscesses
- postoperative wound problems, dressing problems
- minor wounds and lacerations
- minor soft-tissue injuries and burns
- epistaxis
- foreign body (ear, nose, and throat)
- sore throat, cold, and flu
- toothache
- seizure in known epileptics
- resolved hypoglycemia in known IDDM
- back pain
- diarrhea, constipation
- blocked urinary catheter
- emotional or hysterical reaction
- alcohol intoxication
- social problems
- fainting
- falls

IDDM = insulin-dependent diabetes mellitus.

Once clear objectives for CPs are established, further research and operations planning should be undertaken. First, the safety in CP programs must be ensured through careful research and quality-improvement activities. Dispatch algorithms that correctly identify patients in need of CP services, as well as deployment models for CP units, will be essential and must be evidence-based. Designing curricula, mapping required provider competencies, and deriving and validating evaluation tools will be accelerated by partnerships with local colleges, national standards groups, and universities. Community partnerships with non-ED resources will need to be fostered. Finally, stable funding for initial and ongoing program costs must be obtained.

LIMITATIONS

Limitations to this review include publication bias and exclusion of non-English articles and abstracts not accompanied by a manuscript. The three databases searched were most likely to include relevant articles to community paramedicine. Our review of the references in the identified articles and the author-nominated article should minimize the risk of unidentified articles. We did not search the database PsychINFO, where one author-nominated article was listed. We also did not utilize a third reviewer as an adjudicator; however, we experienced very little conflict between the two article reviewers. Further, the heterogeneity of the included articles prohibits meta-analysis. Lastly, several articles were based on the same cohort study[27,29,33] from the United Kingdom.

CONCLUSION

There is a paucity of literature investigating the effectiveness of expanding the scope of paramedic practice; however, the evidence to date suggests that paramedics are capable of learning and applying additional medical competencies. What is lacking is consensus on what CPs should do, and the science supporting the safety and effectiveness of the practice. Clear objectives of community paramedicine programs are required. Achieving consensus on such objectives requires that governments engage EMS agencies, hospitals, general practitioners, community services, public health departments, and others to discuss the role of CPs. Further pragmatic research of

community paramedicine will then be required to fully understand the potential benefits and risks for health systems and patients alike.

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