


ORIGINAL RESEARCH

General Medicine

Emergency Medicine Around the World: Analysis of the 2019 American College of Emergency Physicians International Ambassador Country Reports

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Funding and support: By *JACEP Open* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist.

Objective: The specialty of emergency medicine and recognition of the need for emergency care continue to grow globally. The specialty and emergency care systems vary according to context. This study characterizes the specialty of emergency medicine around the world, trends according to region and income level, and challenges for the specialty.

Methods: We distributed a 56-question electronic survey to all members of the American College of Emergency Physicians International Ambassador Program between March 2019 and January 2020. The Ambassador Program leadership designed the survey covering specialty recognition, workforce, system components, and emergency medicine training. We analyzed results by country and in aggregate using SAS software (SAS Institute Inc). We tested the associations between World Bank income group and number of emergency medicine residency-trained physicians (RTPs) and emergency medicine specialty recognition using non-parametric Fisher's exact testing. We performed inductive coding of qualitative data for themes.

Supervising Editor: Henry Wang, MD, MS

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Results: Sixty-three out of 78 countries' teams (80%) responded to the survey. Response countries represented roughly 67% of the world's population and included countries in all World Bank income groups. Fifty-four countries (86%) recognized emergency medicine as a specialty. Ten (16%) had no emergency medicine residency programs, and 19 (30%) had only one. Eight (11%) reported having no emergency medicine RTPs and 30 (48%) had <100. Fifty-seven (90%) had an emergency medical services (EMS) system, and 52 (83%) had an emergency access number. Higher country income was associated with a higher number of emergency medicine RTPs per capita ($P = 0.02$). Only 6 countries (8%) had >5 emergency medicine RTPs per 100,000 population, all high income. All 5 low-income countries in the sample had <2 emergency medicine RTPs per 100,000 population. Challenges in emergency medicine development included lack of resources (38%), burnout and poor working conditions (31%), and low salaries (23%).

Conclusions: Most surveyed countries recognized emergency medicine as a specialty. However, numbers of emergency medicine RTPs were small, particularly in lower income countries. Most surveyed countries reported an EMS system and emergency access number. Lack of resources, burnout, and poor pay were major threats to emergency medicine growth.

KEYWORDS

emergency medical services, emergency medicine, global health, graduate medical education, healthcare delivery, international health, public health

1 | INTRODUCTION

1.1 | Background

Emergency medicine emerged as a specialty in the 1960s and 1970s in response to the need for high-quality, expedient emergency care of patients arriving to the hospital with time-sensitive complaints.¹ Emergency medicine has been shown to improve the care and outcomes of patients with emergent complaints.²⁻⁴ In 2007, the World Health Assembly Resolution 60.22 called for the involvement of ministries of health in the review and strengthening of trauma and emergency care,⁵ and in 2019 the World Health Assembly Resolution 72.16 "Emergency Care Systems for Universal Health Coverage" identified emergency care as a critical component of the health system.⁶

The first countries to recognize emergency medicine as a specialty were the United Kingdom (1968), United States (1979), Canada (1980), and Australia (1981).^{7,8} By 2003, at least 43 countries provided at least 1 emergency medicine residency program.⁹ Yet emergency medicine does not exist or remains a young specialty in many countries. The medical professionals providing emergency care vary across the health care-resource and emergency medicine development continuums. In one extreme are countries or regions with few resources and few physicians, which may rely on non-physicians (eg, nurses, clinical officers) to provide most emergency care independently. In some areas, general practitioners or physicians from specialties other than emergency medicine provide emergency care with few or no emergency

medicine residency-trained physicians (RTPs). On the other extreme are higher-resource countries or regions where emergency medicine RTPs care for or supervise the care of most patients. Typical milestones in a country's development of the specialty of emergency medicine include, but are not limited to, the creation of emergency medicine residency programs, board certification, specialty associations, peer-reviewed journals, clinical guidelines, and subspecialties.¹⁰ In addition to country-specific developments, regional and international emergency medicine societies, universities, and international development organizations have been important catalysts of emergency medicine development.

1.2 | Importance

Despite the growing presence of emergency medicine, few studies have defined the structure of emergency medicine systems worldwide or compared the scope and availability of the specialty across regions. To our knowledge, no comprehensive overviews of global emergency medicine have been published in almost a decade.

1.3 | Objective of this study

The objective of this study was to characterize the current state of emergency medicine development around the world.

2 | METHODS

2.1 | Design

This study was a descriptive, cross-sectional survey conducted by the American College of Emergency Physicians (ACEP) International Ambassadors. The ACEP International Ambassador Program consists of US and non-US-based emergency physicians promoting the development of their specialty and as of 2019 was active in 78 countries. A delegation of ACEP Ambassadors to a given country consists of 1 or more Ambassadors (eg, Lead Ambassador, In-Country Liaisons, Deputy Ambassadors, Resident Representatives). This study was determined to constitute non-human subject research via the Non-Human Subjects Research Determination Form from the Emory University Institutional Review Board.¹¹

2.2 | Survey instrument development

The Ambassador Program leadership designed the survey tool with input collected from program members during the annual meeting.^{12,13} The survey contained 56 questions covering categories including recognition of emergency medicine as a specialty, estimated numbers of emergency medicine RTPs, residents and residency programs, and open-ended qualitative responses about challenges to emergency medicine growth. Other variables collected including those related to emergency medicine as a specialty (eg, national laws regulating emergency care, procedures in emergency medicine scope of practice), emergency medicine training (eg, presence of fellowship programs and board exams), and emergency medical services (EMS) systems (eg, presence of EMS system, emergency access phone number).

2.3 | Survey dissemination and completion

The Ambassador Program distributed the survey via email, 1 email message per country, with up to 5 reminders for non-responders. Survey responses were collected via Google Forms from March 2019 to January 2020. Ambassadors within each country's delegation worked together to provide 1 response per country, based on personal experiences, correspondence with local colleagues and specialty societies, local government, and educational resources, and published data, when available. Countries with no responses were excluded from the final analysis.

2.4 | Other data sources

We used national population statistics from the United Nations Statistics Division's Demographic Statistics Database based on data from either 2019 or the next closest preceding year.¹⁴ We obtained population data for Taiwan from the Taiwanese National Statistics bureau.¹⁵

The Bottom Line

There are few descriptions of emergency medicine internationally. This survey of 63 countries reveals numerous important findings regarding the current state of emergency medicine internationally, including board recognition of emergency medical services (EMS) as a specialty (86%), as well as the shortage of emergency medicine residency training programs (none in 16%) and emergency medicine residency-trained physicians (none in 11%). Program and physician shortages were more common in lower income countries. These findings highlight important emergency medicine gaps around the world.

We used the World Bank Atlas Method and gross national income (GNI) per capita country income categorization to determine which countries were considered low income (GNI per capita \leq USD \$1,035), lower-middle income (USD \$1,036–\$4,045), upper-middle income (USD \$4,046–\$12,535), or high income (\geq USD \$12,536) economies.¹⁶

2.5 | Data analysis

We graphed the recognition of emergency medicine as a specialty in a map of the world. We drew histograms of the number of emergency medicine residencies and the number of emergency medicine RTPs per country. We calculated the number of emergency medicine RTPs and emergency medicine residencies per 100,000 population and emergency medicine residencies per million population for each country and color coded these variables into categorical groupings based on the observed distributions. We calculated percentages for all categorical and quantitative variables by income level.

We used Fisher's exact test to compare the distribution of World Bank income groups in our sample (countries in the Ambassador Program that responded the survey) to those of countries in the Ambassador Program that did not respond the survey and countries not in the Ambassador Program. We also used Fisher's exact test to examine difference across World Bank income groups in the rate of emergency medicine recognition as a specialty, the number of emergency medicine RTPs per capita, and the rest of the categorical values.

We analyzed free text responses to the question about perceived threats to emergency medicine development using inductive coding. Two coders reviewed responses individually and each developed preliminary codes. The coders worked together to assess each code for clarity and application to different countries and developed a single code book. Each coder then assigned codes from the shared code book. A senior author served as arbitrator for discrepancies between the coders and recorded code frequencies.

We conducted all analyses using SAS (version 9.4M6, SAS Institute Inc).

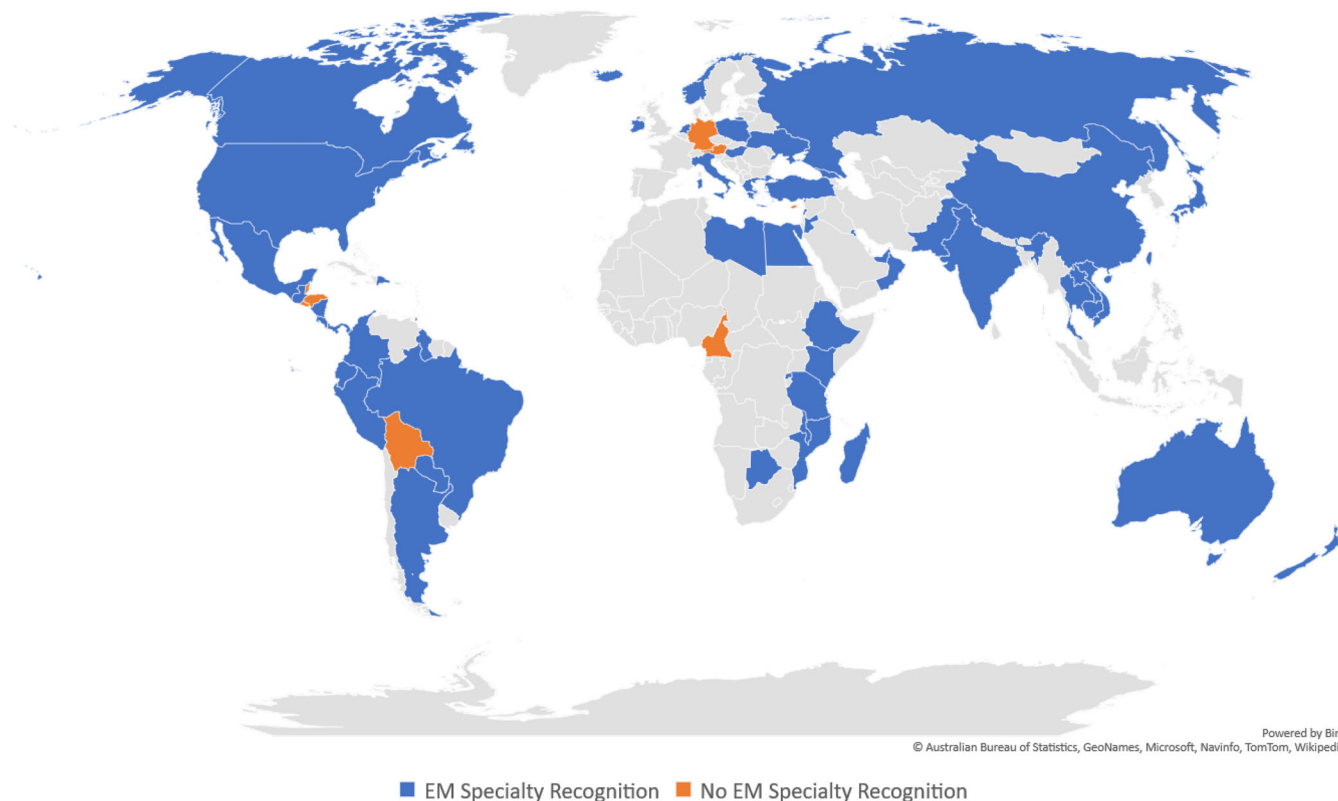


FIGURE 1 Recognition of emergency medicine specialty: Of 63 countries in the 2019 American College of Emergency Physicians Country Report Compilation, 54 (86%) recognized emergency medicine as a specialty (blue) and 9 (14%) did not (orange)

3 | RESULTS

Sixty-three of the 78 ACEP International Ambassador delegations completed a country report, for a response rate of 80% (Figure 1). Individual responses can be found on the ACEP International Ambassador website.¹⁷ The 63 countries in the analysis represented a total population of 5.19 billion (67.3% of the estimated 7.71 billion global population in 2019) (Figure 2). There was no difference in the World Bank country income group distribution between countries in the Ambassador Program that responded the survey and countries in the Ambassador Program that did not respond the survey ($P = 0.25$) or countries that were not part of the Ambassador Program ($P = 0.20$) (Table 1). There were a reported 65,097 emergency medicine RTPs around the globe, with more than half (nearly 36,000) in the United States (Figure 2). Nearly half of responding countries have fewer than 100 emergency medicine RTPs (30; 48%) (Figure 3, Table 2). Emergency medicine RTPs appear to be concentrated in urban areas (Table 2). The higher income group was associated with a higher rate of recognition of emergency medicine as a specialty ($P = 0.02$) (Table 2). Although some upper-middle income and lower-middle income countries had 2–5 emergency medicine RTPs per 100,000 population, the majority had <2 emergency medicine RTPs per 100,000 population. All low-income countries reported <2 RTPs per 100,000 population (Table 2).

Fifty-four (86%) countries recognized emergency medicine as a specialty (Table 2, Figure 1). Only half of responding countries had national laws regulating emergency care (31; 49%), and fewer had national clinical guidelines for emergency care (24; 39%) (Table 2).

As of 2019, an estimated 18,236 physicians were in training to become emergency medicine RTPs. However, the majority of responding countries had 10 or fewer emergency medicine residency programs, with 10 countries (16%) having none (Figure 4). Nearly half of responding countries provide emergency medicine board certification (30; 48%). Among emergency medicine fellowships offered, pediatrics (13; 21%), ultrasound (11; 18%), and critical care (10; 16%) were the most common, though most countries did not have any (41; 66%) (Table 3). Procedures in the scope of practice of emergency medicine RTPs included in the survey were practiced by emergency medicine RTPs in 64% to 88% of countries in the sample (Table 4), except for burr hole craniotomy, cesarean section, abdominal surgery, gastrointestinal endoscopy, and surgical fixation of fractures, which were practiced in only a handful of countries. When compared to both higher income groups as well as the low-income group, a lower proportion of lower middle-income countries practiced lumbar punctures ($P = 0.004$), central venous access ($P = 0.005$), procedural sedation ($P = 0.02$), pericardiocentesis ($P = 0.01$), cardiac pacing ($P = 0.01$), and cesarean section ($P = 0.01$) (Table 4).

FIGURE 2 Select emergency medicine characteristics in countries in American College of Emergency Physicians Country Report Compilation. Countries are listed by World Health Organization Region

Country	Population (millions)	World Bank Income Group	Emergency Medicine specialty recognition	Emergency Medicine board certification exam after residency	Number of Emergency Medicine professional societies	Emergency Medical Services Systems	Estimated Emergency Medicine Residency-Trained Physicians (per 100K population)	Estimated Physicians in Emergency Medicine Residency (per 100K population)	Emergency Medicine Residencies (per million population)
Americas									
Argentina	45	Upper Middle	Yes	No	3	Yes	250 (0.6)	40 (0.1)	35 (0.8)
Belize	0.4	Upper Middle	No	No	0	Yes	0 (-)	0 (-)	0 (-)
Bolivia	11	Lower Middle	No	No	0	Yes	1 (0.01)	2 (0.02)	1 (0.1)
Brazil	210	Upper Middle	Yes	Yes	1	Yes	150 (0.1)	150 (0.1)	24 (0.1)
Canada	38	High	Yes	No	1	Yes	3,000 (8.0)	420 (1.1)	31 (0.8)
Colombia	49	Upper Middle	Yes	No	1	Yes	300 (0.6)	200 (0.4)	8 (0.2)
Costa Rica	5	Upper Middle	Yes	No	1	Yes	110 (2.2)	21 (0.4)	1 (0.2)
Dominican Republic	10	Upper Middle	Yes	No	1	Yes	244 (2.4)	344 (3.3)	9 (0.9)
Ecuador	17	Upper Middle	Yes	No	1	Yes	200 (1.2)	110 (0.6)	2 (0.1)
El Salvador	7	Lower Middle	No	No	1	Yes	2 (0.03)	0 (-)	0 (-)
Guatemala	17	Upper Middle	Yes	No	2	Yes	0 (-)	11 (0.1)	2 (0.1)
Guyana	1	Upper Middle	Yes	No	0	Yes	12 (1.6)	7 (0.9)	1 (1.3)
Honduras	9	Lower Middle	No	No	0	Yes	2 (0.02)	0 (-)	0 (-)
Mexico	127	Upper Middle	Yes	Yes	5+	Yes	6,000 (4.7)	900 (0.7)	72 (0.6)
Nicaragua	7	Lower Middle	Yes	No	1	Yes	200 (3.1)	10 (0.2)	1 (0.2)
Panama	4	High	Yes	Yes	1	Yes	38 (0.9)	15 (0.4)	2 (0.5)
Paraguay	7	Upper Middle	Yes	Yes	1	Yes	25 (0.4)	30 (0.4)	2 (0.3)
Peru	32	Upper Middle	Yes	No	1	Yes	70 (0.2)	80 (0.3)	20 (0.6)
Trinidad and Tobago	1	High	Yes	Yes	1	Yes	41 (3.0)	20 (1.5)	1 (0.7)
United States	328	High	Yes	Yes	5+	Yes	35,856 (10.9)	7861 (2.3)	239 (0.7)
Cuba	9	Upper Middle							
Haiti	12	Low							
Africa									
Botswana	2	Upper Middle	Yes	Yes	0	Yes	3 (0.1)	4 (0.2)	1 (0.4)
Cameroon	25	Lower Middle	No	No	2	Yes	1 (0.00)	0 (-)	0 (-)
Ethiopia	99	Low	Yes	No	1	Yes	100 (0.1)	60 (0.1)	2 (0.02)
Kenya	48	Lower Middle	Yes	No	0	No	2 (0.00)	14 (0.03)	1 (0.02)
Madagascar	27	Low	Yes	Yes	1	Yes	120 (0.5)	120 (0.5)	3 (0.1)
Malawi	18	Low	Yes	No	0	Yes	50 (0.3)	2 (0.01)	1 (0.1)
Mozambique	29	Low	Yes	Yes	0	No	2 (0.01)	6 (0.02)	1 (0.03)
Rwanda	12	Low	Yes	Yes	1	Yes	6 (0.1)	20 (0.2)	1 (0.1)
Tanzania	56	Lower Middle	Yes	No	1	Yes	40 (0.1)	30 (0.1)	1 (0.02)
Zimbabwe	15	Lower Middle	No	No	0	Yes	0 (-)	0 (-)	0 (-)
Togo	8	Low							
Uganda	40	Low							
Eastern Mediterranean									
Egypt	98	Lower Middle	Yes	Yes	3	Yes	405 (0.4)	405 (0.4)	2 (0.02)
Jordan	11	Upper Middle	Yes	Yes	1	Yes	5 (0.1)	121 (1.2)	5 (0.5)
Kuwait	4	High	Yes	Yes	1	Yes	25 (0.6)	20 (0.5)	1 (0.2)
Lebanon	4	Upper Middle	Yes	Yes	2	Yes	30 (0.8)	20 (0.5)	1 (0.3)
Libya	6	Upper Middle	Yes	Yes	1	No	20 (0.3)	400 (6.5)	10 (1.6)
Oman	5	High	Yes	Yes	1	Yes	100 (2.2)	100 (2.2)	10 (2.2)
Pakistan	208	Lower Middle	Yes	Yes	1	No	50 (0.0)	50 (0.02)	7 (0.03)
United Arab Emirates	9	High	Yes	Yes	1	Yes	100 (1.1)	100 (1.1)	5 (0.5)
Afghanistan	31	Low							
Bahrain	1	High							
Iraq	39	Upper Middle							
Israel	9	High							
Saudi Arabia	34	High							
Europe									
Austria	9	High	No	No	1	Yes	0 (-)	0 (-)	1 (0.1)
Cyprus	1	High	No	No	0	Yes	0 (-)	0 (-)	0 (-)
Georgia	4	Upper Middle	Yes	No	2	No	50 (1.3)	50 (1.3)	1 (0.3)
Germany	83	High	No	No	1	Yes	2 (0.00)	0 (-)	0 (-)
Greece	11	High	Yes	No	1	Yes	0 (-)	0 (-)	0 (-)
Hungary	10	High	Yes	Yes	1	Yes	166 (1.7)	166 (1.7)	2 (0.2)
Iceland	0.4	High	Yes	Yes	1	Yes	20 (5.6)	14 (3.9)	1 (2.8)
Ireland	5	High	Yes	Yes	1	Yes	100 (2.0)	52 (1.1)	1 (0.2)
Italy	60	High	Yes	No	1	Yes	550 (0.9)	500 (0.8)	33 (0.6)
Netherlands	17	High	Yes	No	1	Yes	400 (2.3)	400 (2.3)	30 (1.7)
Norway	5	High	Yes	No	1	Yes	4 (0.1)	13 (0.2)	13 (2.4)
Poland	38	High	Yes	Yes	2	Yes	1,016 (2.7)	450 (1.2)	45 (1.2)
Russian Federation	144	Upper Middle	Yes	Yes	1	Yes	150 (0.1)	100 (0.1)	2 (0.01)
Turkey	82	Upper Middle	Yes	No	2	Yes	2,800 (3.2)	1,500 (1.8)	87 (1.1)
Ukraine	42	Lower Middle	Yes	Yes	1	Yes	1,000 (2.4)	150 (0.4)	12 (0.3)
Belgium	11	High							
Switzerland	9	High							
Southeast Asia									
India	1,312	Lower Middle	Yes	Yes	3	Yes	600 (0.1)	200 (0.02)	84 (0.1)
Thailand	66	Upper Middle	Yes	Yes	1	Yes	800 (1.2)	300 (0.5)	18 (0.3)
Indonesia	267	Upper Middle							
Myanmar	54	Lower Middle							
Western Pacific									
Australia	25	High	Yes	No	2	Yes	2,652 (10.5)	2,527 (10.0)	138 (5.4)
Cambodia	15	Lower Middle	Yes	No	0	Yes	100 (0.7)	8 (0.1)	1 (0.1)
China	1,398	Upper Middle	Yes	No	2	Yes	0 (-)	0 (-)	0 (-)
Japan	126	High	Yes	Yes	2	Yes	5,017 (4.0) †	80 (0.1)	554 (4.4)
Lao PDR	7	Lower Middle	Yes	Yes	1	Yes	0 (-)	17 (0.2)	1 (0.1)
New Zealand	5	High	Yes	Yes	1	Yes	300 (6.1)	90 (1.8)	17 (3.5)
Taiwan	24	High	Yes	No	0	Yes	2,000 (8.5)	116 (0.5)	44 (1.9)
Vietnam	96	Lower Middle	Yes	Yes	2	Yes	10 (0.01)	10 (0.01)	1 (0.01)
Korea, Rep	51	High							
Philippines	107	Lower Middle							

Legend

Country Name

World Bank Income Group

Estimated Emergency Medicine Residency-Trained Physicians per 100K population

Estimated Physicians in EM Residency per 100K population

Emergency Medicine Residencies per million population

†This number is not exclusive of emergency medicine residency-trained physicians but instead includes physicians from other specialties who have some training in Emergency Medicine

EMS systems existed in 57 (90%) of responding countries, with 52 (83%) also reporting an emergency access phone number (eg, 911) (Table 5). Most responding countries had a mix of government and privately operated EMS systems, commonly led by the ministry of health. Higher income was associated with higher

availability of government air transport ($P = 0.001$), EMS transport from scene to hospital ($P = 0.04$), and paramedic staffing of ambulances ($P = 0.01$). Lower income was associated with higher rates of personnel without medical training staffing ambulances ($P = 0.003$).

TABLE 1 Sample World Bank country income group distribution compared to countries in the Ambassador Program that did not respond to the survey and countries not in the Ambassador Program

Comparison groups	World Bank country income group				Total	P value
	Low (\leq USD \$1,035)	Lower middle (USD \$1,036–\$4,045)	Upper middle (USD \$4,046–\$12,535)	High (\geq USD \$12,536)		
Ambassador Program countries that responded versus Ambassador Program countries that did not respond						0.20
Countries that responded	5 (8)	15 (23)	21 (33)	22 (34)	63 (81)	
Countries that did not respond	4 (27)	2 (13)	3 (20)	6 (40)	15 (19)	
Countries in the Ambassador Program that responded versus countries not in the Ambassador Program						0.25
Countries that responded	5 (8)	15 (23)	21 (33)	22 (34)	63 (29)	
Countries not in the Ambassador Program	24 (15)	35 (22)	35 (22)	61 (39)	155 (71)	

Column percentages provided in parenthesis.

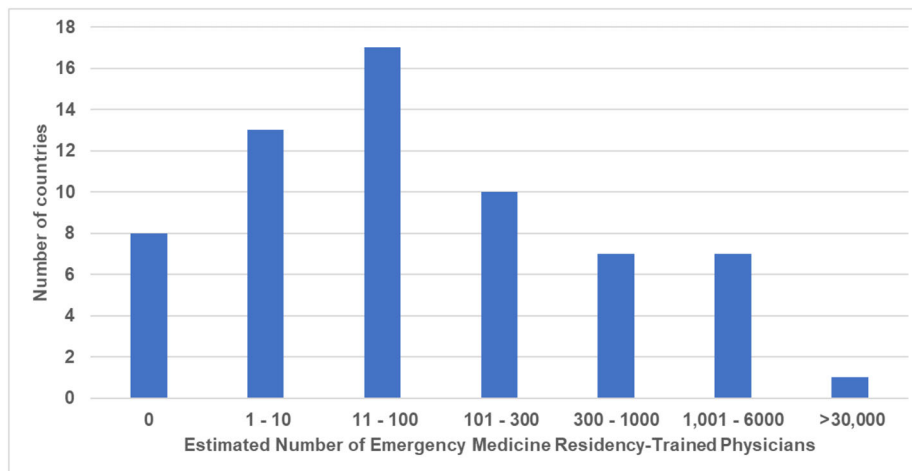


FIGURE 3 Estimated number of emergency medicine residency-trained physicians in countries in 2019 American College of Emergency Physicians Country Report Compilation

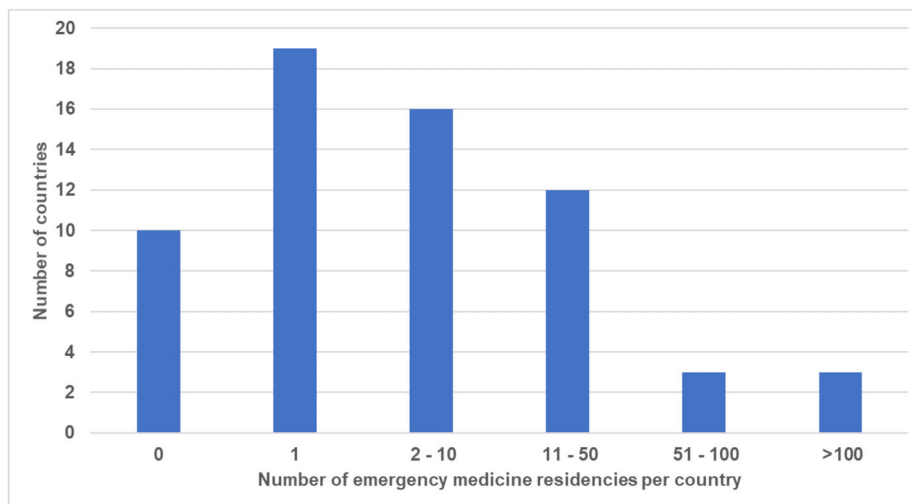


FIGURE 4 Number of emergency medicine residencies per country in 2019 American College of Emergency Physicians Country Report Compilation

TABLE 2 Emergency medicine specialty and workforce

Characteristic	World Bank country income group				Total n (%)	P value
	Low (\leq USD \$1,035)	Lower middle (USD \$1,036- \$4,045)	Upper middle (USD \$4,046- \$12,535)	High (\geq USD \$12,536)		
Emergency medicine recognition as a specialty						0.11
Yes	5 (100)	10 (67)	20 (95)	19 (86)	54 (86)	
No	0 (0)	5 (33)	1 (5)	3 (14)	9 (14)	
Estimated number of emergency medicine residency-trained physicians per 100,000 population						0.0
> 5	0 (0)	0 (0)	0 (0)	6 (27)	6 (10)	
2–5	0 (0)	2 (13)	4 (19)	6 (27)	12 (19)	
< 2	5 (100)	13 (87)	17 (81)	10 (46)	45 (71)	
At least 1 emergency medicine society (n = 63)						0.02
Yes	3 (60)	9 (60)	18 (86)	21 (95)	51 (81)	
No	2 (40)	6 (40)	3 (14)	1 (5)	12 (19)	
Number of emergency medicine residency-trained physicians (n = 63)						0.23
0	0 (0)	2 (13)	3 (14)	3 (14)	8 (13)	
1–10	3 (60)	6 (40)	2 (10)	2 (9)	13 (21)	
11–100	1 (20)	3 (20)	6 (29)	7 (32)	17 (27)	
101–300	1 (20)	1 (7)	6 (29)	2 (9)	10 (16)	
301–1000	0 (0)	3 (20)	2 (10)	2 (9)	7 (11)	
1001–6000	0 (0)	0 (0)	2 (10)	5 (23)	7 (11)	
> 30,000	0 (0)	0 (0)	0 (0)	1 (5)	1 (2)	
Percentage of emergency departments with at least 1 emergency medicine residency-trained physician (n = 63)						0.12
0%	1 (20)	5 (33)	3 (14)	4 (18)	13 (21)	
1% to 20%	4 (80)	8 (53)	11 (52)	4 (18)	27 (43)	
21% to 40%	0 (0)	2 (13)	2 (10)	4 (18)	8 (13)	
41% to 60%	0 (0)	0 (0)	1 (5)	0 (0)	1 (2)	
61% to 80%	0 (0)	0 (0)	2 (10)	6 (27)	8 (13)	
81% to 100%	0 (0)	0 (0)	2 (10)	4 (18)	6 (10)	
Percent of emergency medicine residency-trained physicians working in urban areas (n = 57)						0.99
60%	0 (0)	0 (0)	1 (5)	1 (5)	2 (4)	
80%	0 (0)	1 (9)	1 (5)	3 (14)	5 (9)	
90%	2 (50)	3 (27)	5 (24)	5 (24)	15 (26)	
100%	2 (50)	6 (55)	11 (52)	9 (43)	28 (49)	
n/a (no emergency medicine RTPs)	0 (0)	1 (9)	3 (14)	3 (14)	7 (12)	
National laws regulating emergency care (n = 63)						0.21
Yes	2 (40)	4 (27)	12 (57)	13 (59)	31 (49)	
No	3 (60)	11 (73)	9 (43)	9 (41)	32 (51)	
National clinical guidelines for emergency care (n = 62)						0.22
Yes	2 (50)	4 (27)	6 (29)	12 (55)	24 (39)	
No	2 (50)	11 (73)	15 (71)	10 (45)	38 (61)	
Peer-reviewed emergency medicine journal (n = 63)						0.15
Yes	0 (0)	3 (20)	5 (24)	10 (45)	18 (29)	
No	5 (100)	12 (80)	16 (76)	12 (55)	45 (71)	

Column percentages provided in parenthesis.

TABLE 3 Emergency medicine education

Characteristic	World Bank country income group			Total	n (%)	P value
	Low (\leq USD \$1,035)	Lower middle (USD \$1,036-\$4,045)	Upper middle (USD \$4,046-\$12,535)			
Number of residencies (n = 63)						0.14
0	0 (0)	4 (27)	2 (10)	4 (18)	10 (16)	
1	3 (60)	7 (47)	5 (24)	4 (18)	19 (30)	
2–10	2 (40)	2 (13)	8 (38)	4 (18)	16 (25)	
11–50	0 (0)	1 (7)	4 (19)	7 (32)	12 (19)	
51–100	0 (0)	1 (7)	2 (10)	0 (0)	3 (5)	
> 100	0 (0)	0 (0)	0 (0)	3 (14)	3 (5)	
Residents in training (n = 63)						0.80
0	0 (0)	4 (27)	2 (10)	4 (18)	10 (16)	
1–20	3 (60)	6 (40)	4 (19)	5 (23)	18 (29)	
21–100	1 (20)	2 (13)	6 (29)	5 (23)	14 (22)	
101–300	1 (20)	2 (13)	5 (24)	2 (9)	10 (16)	
301–1000	0 (0)	1 (7)	3 (14)	4 (18)	8 (13)	
1001–3000	0 (0)	0 (0)	1 (5)	2 (9)	3 (5)	
Board certification (n = 63)						0.15
Yes	3 (60)	4 (27)	9 (43)	14 (64)	30 (48)	
No	2 (40)	11 (73)	12 (57)	8 (36)	33 (52)	
Fellowships (n = 63) ^a						
None	3 (60)	11 (73)	16 (76)	13 (59)	43 (68)	0.63
Pediatrics	0 (0)	4 (27)	4 (19)	5 (23)	13 (21)	0.79
Critical care	2 (40)	2 (13)	2 (10)	6 (27)	12 (19)	0.23
Ultrasound	0 (0)	0 (0)	3 (14)	8 (36)	11 (17)	0.03
Emergency medical services	0 (0)	1 (7)	0 (0)	6 (27)	7 (11)	0.03
Toxicology	0 (0)	0 (0)	1 (5)	5 (23)	6 (10)	0.12
Sports medicine	0 (0)	0 (0)	0 (0)	4 (18)	4 (6)	0.07
Administrative	0 (0)	0 (0)	1 (5)	2 (9)	3 (5)	0.83
Informatics	0 (0)	0 (0)	0 (0)	1 (5)	1 (2)	0.99
Interventional radiology	0 (0)	0 (0)	0 (0)	1 (5)	1 (2)	0.99
Acute care surgery/orthopedics/neurosurgery	0 (0)	0 (0)	0 (0)	1 (5)	1 (2)	0.99
Trauma	0 (0)	0 (0)	0 (0)	1 (5)	1 (2)	0.99

Column percentages provided in parenthesis.

^aNon-mutually exclusive answer options.

Free text responses about threats to emergency medicine development were coded into themes, which were grouped into 12 main categories. The most common were limited economic resources in the health system (n = 20; 38%), burnout and poor working conditions (n = 16; 31%), low salaries (n = 12; 23%), and governmental mismanagement (n = 11; 21%) (Table 6).

4 | LIMITATIONS

This study provides an overview of emergency medicine around the world, though with important limitations. The data for each country were based on descriptions by the respondents rather than systematic measurements because these statistics are not available for most

TABLE 4 Procedures in scope of practice of emergency medicine residency trained physicians

	World Bank country income group				Total	P value
	Low (\leq USD \$1,035)	Lower middle (USD \$1,036-\$4,045)	Upper middle (USD \$4,046-\$12,535)	High (\geq USD \$12,536)		
Skills in scope of practice (n = 58)^a	n (%)	n (%)	n (%)	n (%)	n (%)	
Lumbar puncture	5 (100)	7 (46)	20 (95)	18 (82)	50 (86)	0.004
Intubation	5 (100)	9 (60)	19 (91)	17 (77)	50 (86)	0.12
Central venous access	5 (100)	7 (47)	20 (95)	17 (77)	49 (84)	0.005
Chest tube	5 (100)	8 (53)	18 (86)	17 (77)	48 (83)	0.09
Bedside ultrasound	5 (100)	8 (53)	16 (76)	18 (82)	47 (81)	0.14
Dislocation reduction	4 (80)	7 (47)	17 (81)	17 (77)	45 (78)	0.12
Procedural sedation	5 (100)	6 (40)	17 (81)	17 (77)	45 (78)	0.02
Cricothyrotomy	4 (80)	7 (47)	16 (76)	16 (73)	43 (74)	0.25
Vaginal delivery	5 (100)	8 (53)	15 (71)	14 (64)	42 (72)	0.30
Pericardiocentesis	4 (80)	4 (27)	15 (71)	17 (77)	40 (69)	0.01
Cardiac pacing	2 (40)	4 (27)	14 (67)	17 (77)	37 (64)	0.01
Burr hole craniotomy	0 (0)	1 (7)	0 (0)	2 (9)	3 (5)	0.58
Caesarean section	2 (40)	0 (0)	0 (0)	1 (5)	3 (5)	0.01
Abdominal surgery, gastrointestinal endoscopy, surgical fixation of fractures	0 (0)	0 (0)	0 (0)	1 (5)	1 (2)	0.99

Column percentages provided in parenthesis.

^aNon-mutually exclusive answer options.

countries. Similarly, information was provided by only 1 or a few ACEP Ambassadors for each country, and thus, may not represent a comprehensive or exhaustive survey of emergency medicine opinions within each country. Furthermore, informants were emergency physicians, so the opinions of general practitioners, clinical officers, nurses, and other important emergency care personnel may be underrepresented in this study.

There is a possibility of response bias in the sample. The ACEP Ambassador program consists of volunteer, dues-paying ACEP members reporting about their partnerships rather than systematically assigned representation for every country around the globe. Although every World Health Organization region is included, the program has the most representation in the Americas and the least in the African and Southeast Asia regions (57% vs 21% to 22%, respectively). This may be related to a combination of factors including proximity to the United States, language barriers, perception of value in partnering with the United States as an emergency medicine leader, funding for partnerships, and national interest in developing emergency medicine systems. Similarly, countries without ACEP ambassadors may have less developed emergency medicine systems, with notable exceptions such as the United Kingdom, one of the first countries recognizing emergency medicine.

Comparisons across countries in certain categories are limited as countries may have different definitions for certain variables. For example, the definition of what constitutes residency training itself may vary across countries given differences in length, curriculum, and level of supervision between programs. Capturing these details in

future studies would allow for more in-depth comparisons. Lastly, the emphasis of this study was on the specialty of emergency medicine and provides limited information about emergency care delivery (eg, use of triage, disease specific protocols, length of stay, patient-centered outcomes). More studies are needed to look at these variables across countries, regions, and income levels.

5 | DISCUSSION

Emergency medicine is entering its sixth decade as an independent medical specialty and continues to expand globally. Emergency medicine recognition as a specialty grew from a handful of countries in the 1970s, to 41 countries in 2000,¹⁸ 45 in 2009,¹⁹ and 54 countries in our 2019 sample—which actually underestimates the true number because at least a few countries known to recognize emergency medicine (eg, United Kingdom, Chile) were not part of the Ambassador Program and thus not included in our study. The great majority of the countries had emergency medicine residency programs, emergency medicine national societies, EMS systems, and an emergency access phone number (eg, 911), all important milestones of emergency medicine development.

However, other achievements in global emergency medicine growth were less widespread. Fewer than half of countries had emergency medicine RTPs in most emergency departments, and most countries had <2 emergency medicine RTPs per 100,000 population. Only half of countries offered board certification, and fewer than half had national

TABLE 5 Emergency medical services systems

Characteristics	World Bank country income group				Total n (%)	P value
	Low (\leq USD \$1,035)	Lower middle (USD \$1,036- \$4,045)	Upper middle (USD \$4,046- \$12,535)	High (\geq USD \$12,536)		
EMS system (n = 63)						0.08
Yes	4 (80)	12 (80)	19 (90)	22 (100)	57 (90)	
No	1 (20)	3 (20)	2 (10)	0 (0)	6 (10)	
Emergency access phone number (eg, 911) (n = 63)						0.002
Yes	4 (80)	8 (53)	18 (86)	22 (100)	52 (83)	
No	1 (20)	7 (47)	3 (14)	0 (0)	11 (17)	
EMS transport provided by (n = 62) ^a						
Government ground	4 (80)	12 (87)	17 (85)	21 (95)	55 (89)	0.34
Private ground	4 (80)	13 (87)	17 (81)	16 (73)	50 (80)	0.83
Government air	1 (20)	5 (33)	10 (50)	19 (86)	35 (56)	0.001
Private air	0 (0)	8 (53)	11 (55)	7 (32)	26 (42)	0.10
Who Leads EMS (n = 62) ^a						
Ministry of health	4 (80)	10 (67)	15 (75)	17 (77)	46 (74)	0.93
Private organization	3 (60)	8 (53)	9 (45)	8 (36)	28 (45)	0.81
Local government	2 (40)	3 (20)	6 (30)	7 (32)	18 (29)	0.78
Hospitals	1 (20)	4 (27)	4 (20)	8 (36)	17 (27)	0.67
Other national gov organization	0 (0)	1 (7)	5 (23)	4 (18)	10 (16)	0.51
EMS uses (n = 62) ^a						
Hospital to hospital	5 (100)	15 (100)	19 (90)	20 (91)	59 (95)	0.76
Scene to hospital	4 (80)	13 (87)	21 (100)	22 (100)	60 (97)	0.04
Treatment at scene without transport	1 (20)	5 (33)	8 (38)	12 (55)	26 (42)	0.45
Levels of personnel (n = 63) ^a						
Emergency medical technician	3 (60)	9 (60)	16 (76)	15 (68)	43 (68)	0.74
Paramedic	1 (20)	6 (40)	12 (57)	18 (82)	37 (59)	0.01
Physician	1 (20)	8 (53)	15 (71)	14 (64)	38 (60)	0.19
Nurse	2 (40)	8 (53)	10 (48)	7 (32)	27 (43)	0.59
Personnel without medical training	3 (60)	8 (53)	3 (14)	2 (9)	16 (25)	0.003
EMS medical control protocols (n = 63)						0.001
Yes	1 (20)	6 (40)	12 (57)	20 (91)	39 (62)	
No	4 (80)	9 (60)	9 (43)	2 (9)	24 (38)	

Column percentages provided in parenthesis. Abbreviation: EMS, emergency medical services.

^aNon-mutually exclusive answer options.

laws regulating emergency care, national clinical guidelines for emergency care, emergency medicine peer-reviewed journals, or any emergency medicine subspecialty training. As evidenced in Figure 2 and the individual country reports,¹⁷ countries have reached emergency medicine development milestones to different degrees. Overall emergency medicine remains underdeveloped in most countries in our sample. Similar studies in the future can help track emergency medicine growth in individual countries and globally.

Perhaps unsurprisingly, we found associations between country income groups and certain emergency medicine development mile-

stones. Higher income was associated with a higher number of emergency medicine RTPs per population and higher frequency of ultrasound and critical care fellowships, EMS protocols, trained paramedics, scene-to-hospital transportation, and prehospital government air transport. Lower income was associated with a higher rate of personnel without medical training participating in EMS and a higher rate of emergency medicine RTPs performing cesarean sections. Potential explanations for these findings in lower-income countries are lack of other trained personnel or resources for transfer to other facilities. Interestingly, countries in the lower middle-income group—and not

TABLE 6 Perceived threats to emergency medicine development

Threat to emergency medicine development (n = 52)	Number of countries	%
Limited economic resources in health system	20	38%
Burnout and poor working conditions	16	31%
Low salaries	12	23%
Governmental mismanagement	11	21%
Disorganized or fragmented healthcare system	10	19%
Residency training: lack of resources, lack of standardization, too few residencies	9	17%
Lack of cooperation with other specialties or with general practitioners	8	15%
Lack of emergency medicine specialty recognition	7	13%
Lack of fellowship and faculty training programs after residency	5	10%
Lack of leadership within emergency medicine	3	6%
Privatization of emergency care	3	6%
Physician "brain drain"	1	2%

the low-income group—were more likely to lack an emergency access phone number and to lack certain procedures in the scope of practice of emergency medicine RTPs (lumbar puncture, central line placement, procedural sedation, pericardiocentesis, and cardiac pacing). Sampling may be the most likely explanation, because our sample had only 5 low-income countries, which perhaps were more advanced in emergency medicine development than most other low-income countries and more likely to have had connections in international emergency medicine, such as the ACEP Ambassador required to be in our study.

The most common threat to the growth of emergency medicine reported was limited economic resources in the health system. This is not surprising, given the well-known global inequity in health care resources, despite significant gains in the last few decades.²⁰ The next most reported threats were burnout and poor working conditions, especially related to scheduling and dysfunctional processes at work. EDs can be stressful environments, and there is a growing recognition of the need for wellness curricula and support systems for emergency medicine RTPs.^{21,22} Beyond empowering individuals, scheduling and ED process improvement could improve the well-being of ED personnel. The third most common threat reported was low salaries, leading to recruitment and retention concerns. Potential causes reported included difficulties negotiating salaries, lack of clear career paths, and pitfalls related to collecting payments from uninsured patients with medical emergencies. With increasing recognition of the importance of high-quality emergency care, we hope that emergency medicine RTPs and their professional societies can advocate for improved salaries and working conditions.

Despite its convenience sampling and other limitations, to our knowledge, this article represents the first survey on global emergency medicine development in almost 2 decades and provides the first peer-reviewed overview of global emergency medicine in a decade. Most previously published global emergency medicine development literature relies on literature reviews and authors' experiences in emergency medicine development,^{9,10,19,23–26} with the most recent of these articles, to our knowledge, published in 2009.¹⁹ A survey by Nagurney et al. in 2000 included more countries (87 vs 63) but listed results by region and not the country-level detail we provided.¹⁸ Thus, our study not only benchmarked the global growth of emergency medicine in 2019 but allows for comparisons across countries unlike prior publications on the subject.

The global snapshot of emergency medicine and country-level data from our study can inform policy makers as well as national and transnational organizations working on future emergency medicine development and emergency care projects. Furthermore, the pioneers and leaders of emergency medicine working to establish or strengthen the specialty where it does not exist, or where it is in early stages of development, can refer to the data presented here while advocating for more resources and recognition for the specialty in their settings. Finally, we hope this and other studies about emergency medicine around the world inspire future international educational, research, and policy collaborations to continue developing the specialty and improving emergency care globally.

ACKNOWLEDGMENTS

This work would not have been possible without the work of the ACEP International Ambassadors who collaborate with local partners to promote the growth of emergency medicine and improvements in emergency care globally and filled out the 2019 ACEP Ambassador Country Reports.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

AUTHOR CONTRIBUTIONS

Authors Andrés M. Patiño, Elizabeth L. DeVos, and Christian Arbelaez contributed to the study concept and design. Dr. Jeffrey Chen led data acquisition. All authors analyzed data and drafted sections of initial version of the manuscript. All authors contributed to the critical revision of the overall manuscript.

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How to cite this article: Patiño AM, Chen J, DeVos EL, et al. Emergency Medicine Around the World: Analysis of the 2019 American College of Emergency Physicians International Ambassador Country Reports. *JACEP Open*. 2022;3:e12681. <https://doi.org/10.1002/emp2.12681>