

Medical emergencies in general practice in south-east Queensland: prevalence and practice preparedness

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GENERAL PRACTITIONERS, as the first point of contact for most patients in the community, need to be appropriately skilled and equipped to deal with medical emergencies. Reports in the medical literature suggest that Australian rural GPs may encounter a life-threatening illness almost once a week,¹ but similar estimates for metropolitan practices are not available.

In 1981, an Australia-wide survey of 230 GPs indicated that GPs respond to "a condition or message that requires immediate attention" an average of nine times per month.² Generally, however, studies of the epidemiology of presentations to Australian general practices have not focused specifically on medical emergencies and the extent to which practices are prepared with emergency drugs and equipment.^{3,4}

We conducted a population-based survey in south-east Queensland to determine GPs' experience of medical emergencies. We report here the nature and frequency of medical emergencies encountered by metropolitan and non-metropolitan GPs, and the availability of medical emergency drugs and equipment in their practices.

METHODS

Design and sample selection

A random-sample survey of GPs in south-east Queensland was conducted between October 1999 and March 2000. The Australasian Medical Publishing Company Limited (AMPCo), Sydney, provided a stratified random sample of 1000 GPs, and their contact

ABSTRACT

Objective: To determine the type and frequency of emergencies in general practice, and the extent to which general practices are equipped to appropriately respond to emergencies.

Design: Random-sample, cross-sectional questionnaire survey of general practitioners, October 1999 – March 2000.

Setting: General practices in south-east Queensland.

Participants: 512 of 900 eligible GPs in current clinical practice.

Main outcome measures: The type and frequency of medical emergencies presenting to GPs, and descriptive details of emergency drugs and equipment available in their practices.

Results: 512 GPs (response rate, 57%) reported managing a cumulative total of 5640 emergencies over the preceding 12 months. Non-metropolitan GPs saw about 30% more emergencies than their metropolitan counterparts (median, 9 and 7, respectively; $P=0.02$). The most common emergencies (seen by more than 30% of all GPs) were acute asthma, psychiatric emergencies, convulsions, hypoglycaemia, anaphylaxis, impaired consciousness, shock, poisoning and overdose. Most GPs (77%) stocked 15 or more of the 16 emergency doctor's bag drugs, but a smaller proportion (67%) had all of the basic emergency equipment items considered essential.

Conclusions: A substantial number of patients with potentially life-threatening emergencies present to GPs. Doctor's bag emergency drugs are available in most general practices, but availability of basic emergency equipment is suboptimal.

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details, from their national database of medical practitioners. Specific inclusion criteria were GPs currently practising medicine in south-east Queensland, and only one GP per practice (to avoid duplicate reporting of practice equipment and drugs). The selection was stratified to ensure that 20% of the sample were rural GPs, in accordance with the national distribution of rural GPs.⁵

Sample size

We assumed that 40% of general practices have the recommended basic medical emergency equipment.⁶ Thus, 369 survey respondents would be sufficient to estimate the population prevalence to within 5% of its true value (using a 95% confidence level). We also estimated, conservatively, that 75% of contacted GPs would be eligible for the study and 50% of eligible GPs would return the questionnaire,^{7,8} requiring an increase in the sample size from 369 to 1000.

Questionnaire

A self-administered questionnaire was developed to obtain information on GPs' demographic characteristics, the availability of emergency resuscitation equipment and drugs, and the frequency with which GPs had managed the listed emergencies in the preceding

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12 months. GPs at the University of Queensland's Centre for General Practice piloted the questionnaire for comprehensibility and the format's practicability.

Variables

■ Demographic variables included age, sex, hours worked per week, nature and geographical location of practice, and number of GPs in the practice. Part-time work was defined as fewer than 36 hours per week.⁹

■ Geographical locations of practices were partitioned according to the rural, remote and metropolitan areas classification (RRaMA), with Codes 1 and 2 taken to represent metropolitan areas and Codes 3-7 taken to represent non-metropolitan areas.¹⁰ Within the non-metropolitan grouping were subgroups corresponding to rural zones (Codes 3-5) and remote zones (Codes 6 and 7).

■ Emergency resuscitation equipment and drug lists were compiled with reference to the Royal Australian College of General Practitioners' (RACGP) Entry Standards for General Practices,¹¹ the Schedule of Pharmaceutical

Benefits Emergency Drug (doctor's bag) supplies,¹² and the published literature.¹³⁻¹⁶ A list of 18 emergencies considered most likely to be encountered in general practice was compiled using the Blakiston Gould definition of a medical emergency,¹⁷ and the published literature.^{2,13-16} GPs were also given the opportunity to report emergencies not included on our list.

Recruitment process

Preliminary telephone calls were made to the practices of the 1000 randomly selected GPs to ascertain their current working status and to confirm mailing details. If two doctors were found to be working at the same practice, the second listed doctor was excluded. All eligible GPs were then sent the questionnaires by post, with an accompanying letter explaining the purpose of the study and assuring confidentiality. For practice-related questions, doctors working in more than one general practice were asked to refer to the practice in which they worked the most hours. Non-responding doctors received reminder

calls two and four weeks after the questionnaire mailing.⁸

Data analysis

Questionnaire results were double-entered into a database and consistency checks performed. Medians and interquartile ranges (IQR) are reported because the frequency distributions for GPs' responses to many variables were skewed. Demographic data were compared with population normative data for Queensland from the Australian Institute of Health and Welfare (AIHW).⁵ Fisher's exact test was used for bivariate comparisons of categorical data, and Wilcoxon's rank sum test and the Kruskal-Wallis test were used to compare data for two groups and several groups, respectively.¹⁸ The SAS software package was used for all statistical analyses.¹⁹

Ethical approval

The study was approved by the Research and Evaluation Ethics Committee of the RACGP and the University of Queensland's Behavioural and Social Sciences Ethical Review Committee.

1: Demographic characteristics of participating GPs (n=512)* compared with those of Queensland GPs (data from the Australian Institute of Health and Welfare [AIHW] national survey of GPs)⁵

Variable	Survey participants	Queensland GPs	P†
Age (years)			
<35	49 (10%)	612 (17%)	
35-44	164 (32%)	1261 (35%)	
45-54	170 (33%)	965 (27%)	<0.001
55-64	101 (20%)	440 (12%)	
≥65	26 (5%)	361 (10%)	
Sex			
Male	352 (69%)	2419 (66%)	0.23
Female	157 (31%)	1221 (34%)	
Geographical location (RRaMA classification‡)			
Metropolitan	362 (71%)	2469 (68%)	
Non-metropolitan			
Rural	142 (28%)	1085 (30%)	0.28
Remote	8 (2%)	87 (2%)	
Hours per week worked in general practice§			
<36 hours	128 (25%)	1036 (28%)	0.24
≥36 hours	377 (75%)	2676 (72%)	
Number of GPs in main general practice			
1	171 (34%)	483 (13%)	
2-3	188 (37%)	988 (27%)	<0.001
≥4	147 (29%)	2170 (60%)	

* Totals may be less than 512 because of missing or incomplete data.

† P-values were calculated using Fisher's exact test.

‡ RRaMA — Rural, Remote and Metropolitan Area classification.¹⁰

§ AIHW (QLD) data classified full-time as ≥36 hours.⁹

RESULTS

Response rate and sample characteristics

Of the 1000 GPs initially approached, 100 (10%) were ineligible for inclusion: unknown at the contact address (39), not GPs (27), the practice was duplicated (13), retired from general practice (11), not currently employed in general practice (7), illness (2), and deceased (1). Questionnaires were mailed to the 900 eligible GPs and 512 (57%) were completed and returned.

The demographic details of respondents are shown in Box 1. The male to female ratio was about 2:1, as was the ratio of GPs working in group practices versus solo practices. About 30% of GPs were classified as practising in a non-metropolitan locality and 25% worked part-time. In our sample, compared with Queensland GPs in general⁵ GPs from solo practices were significantly over represented ($P<0.001$), as were middle-aged respondents ($P<0.001$). Age was significantly related to practice size, with a greater proportion of GPs aged 45-64 years working in solo prac-

2: Number (%) of GPs who reported managing each of the listed emergencies at least once in the preceding 12 months

Type of emergency	Total (n=488)*	Metropolitan (n=345)	Non-metropolitan (n=143)	P†
Acute asthma	352 (72%)	249 (72%)	103 (72%)	1.00
Psychiatric	281 (58%)	191 (55%)	90 (63%)	0.13
Convulsion	237 (49%)	167 (48%)	70 (49%)	0.92
Hypoglycaemia	191 (39%)	133 (39%)	58 (41%)	0.68
Anaphylaxis	176 (36%)	119 (34%)	57 (40%)	0.30
Impaired consciousness	173 (35%)	119 (34%)	54 (38%)	0.53
Shock	166 (34%)	101 (29%)	65 (45%)	<0.001
Poisoning	159 (33%)	106 (31%)	53 (37%)	0.20
Overdose	155 (32%)	104 (30%)	51 (36%)	0.24
Cardiac arrest	98 (20%)	50 (14%)	48 (34%)	<0.001
Coma	85 (17%)	47 (14%)	38 (27%)	<0.001
Diabetic ketoacidosis	75 (15%)	49 (14%)	26 (18%)	0.27
Major trauma	59 (12%)	31 (9%)	28 (20%)	0.002
Respiratory arrest	46 (9%)	24 (7%)	22 (15%)	0.006
Inhaled foreign body	31 (6%)	23 (7%)	8 (6%)	0.84
Thyroid crisis	16 (3%)	10 (3%)	6 (4%)	0.58
Immersion	16 (3%)	10 (3%)	6 (4%)	0.58
Asphyxia	13 (3%)	7 (2%)	6 (4%)	0.22

* 24 (5%) respondents failed to answer questions relating to types of emergency.
† P-values were calculated using Fisher's exact test.

3: Items present in general practice, by equipment category (n = 512)

Equipment item	Practices with item
Basic airway	
Oropharyngeal airway*†	459 (90%)
Bag-valve-mask*†	464 (91%)
Suction	296 (58%)
Oxygen*	429 (84%)
Advanced airway	
Laryngoscope	305 (60%)
Endotracheal tube	292 (57%)
Nebuliser*	481 (94%)
Vascular access	
Tourniquet*	488 (95%)
Intravenous cannulas*	432 (84%)
Intravenous fluids	336 (66%)
Glucometer*	481 (94%)
Circulation	
Electrocardiograph	489 (96%)
Defibrillator	66 (13%)
Sphygmomanometer*†	505 (99%)
Practice management	
Protocol for regular checking of equipment	269 (53%)
Medical Emergency Plan	160 (31%)

* Items we considered essential.

† Items required for RACGP accreditation.

tices (65%) than group practices (47%) ($P < 0.001$). No other statistically significant differences were found.

The median number of reported hours worked in general practice was 45 (IQR: 25, 52 hours). There was a statistically significant association between the sex of the doctor and working status, with 88% of men working full time, compared with only 44% of women ($P < 0.001$).

Emergencies

GPs reported managing 5640 emergencies during the previous 12 months (95% of GPs saw at least one patient potentially requiring resuscitation). The distribution was skewed, with the median number of emergencies per GP being 8 (IQR: 3, 14). The proportion of GPs managing each of the listed emergencies at least once in the preceding 12 months is shown in Box 2. The three most frequently encountered emergencies were acute asthma (72%), psychiatric emergencies (58%) and convulsions (49%).

After adjusting for the number of hours worked, there was no significant difference between the number of emergencies seen and the sex of the doctor. GPs working in non-metropolitan areas saw 30% more emergencies (median, 9;

IQR: 4, 16) than those working in metropolitan areas (median, 7; IQR: 3, 14) ($P = 0.02$); and a significantly greater proportion of non-metropolitan than metropolitan GPs saw shock, cardiac arrest, coma, major trauma and respiratory arrest emergencies.

Equipment

The medical emergency equipment items carried by practices are shown in Box 3. The median number of items per practice was 12 (IQR: 10, 14), with 21 (5%) practices having all 16 equipment items and 7 (1%) having only three items. Sixty-seven per cent of practices had all the eight equipment items we considered essential (oropharyngeal airway, bag-valve-mask, oxygen, nebuliser, tourniquet, intravenous cannulas, Glucometer and sphygmomanometer). Associations between the availability of equipment in practices and practice size and location are shown in Box 4.

Group practices (265; 79%) were significantly more likely than solo practices (70; 41%) to carry all the items we considered essential ($P < 0.001$). Of the items of general practice equipment specified by the RACGP Standards for General Practices,²⁰ the three items relevant to resuscitation (oropharyngeal airway, bag-valve-mask, and sphygmo-

manometer) were present in 440 general practices (86%), with 303 group practices (91%) compared with 131 (77%) solo practices having this equipment ($P < 0.001$). Practice location was not a significant factor influencing the availability of equipment (Box 4).

Drugs

Box 5 shows the availability of emergency drugs in practices, and indicates those listed drugs included in the current Schedule of Pharmaceutical Benefits Emergency Drug (doctor's bag) supplies,²¹ and those required to manage the top 10 emergencies identified from our data. Overall, 134 (27%) GPs reported knowing that their practices held all of the 21 listed drugs, with 255 (51%) reporting 20 or more drugs. For each drug present, at least 87% of GPs reported knowing it to be within expiry date. While only 291 (58%) practices carried all the 16 drugs specified in the doctor's bag (Box 4), 383 (77%) had at least 15 of the 16 drugs and 319 (64%) had all the drugs we considered necessary to treat the 10 most common emergencies identified in our study. Group practices were significantly better equipped with both categories of emergency drugs, while practice location made no difference to either category (Box 4).

4: Number (%) of practices (n = 512)* with essential emergency equipment and emergency drugs, according to practice size and location

	Total	Practice size			Location		
		Solo	Group	Pt	Metropolitan	Non-metropolitan	Pt
Eight essential items of resuscitation equipment†							
Yes	340 (67%)	70 (41%)	265 (79%)	<0.001	236 (65%)	104 (69%)	0.41
No	171 (33%)	101 (59%)	69 (21%)		125 (35%)	46 (31%)	
Three items relevant to resuscitation in the RACGP Standards for General Practice							
Yes	440 (86%)	131 (77%)	303 (91%)	<0.001	308 (85%)	132 (88%)	0.48
No	71 (14%)	40 (23%)	31 (9%)		53 (15%)	18 (12%)	
Drugs listed in doctor's bag: 16 specified drugs							
Yes	291 (58%)	82 (50%)	206 (63%)	0.007	207 (58%)	84 (58%)	0.84
No	209 (42%)	83 (50%)	123 (37%)		147 (42%)	62 (42%)	
Eight drugs used to treat the 10 commonest emergencies							
Yes	319 (64%)	94 (57%)	222 (67%)	0.02	231 (65%)	88 (60%)	0.31
No	181 (36%)	71 (43%)	107 (33%)		123 (35%)	58 (40%)	

* Totals are less than 512 because of missing or incomplete data.

† P-values were calculated using Fisher's exact test.

‡ Oropharyngeal airway, bag-valve-mask, oxygen, nebuliser, tourniquet, intravenous cannulas, Glucometer and sphygmomanometer.

5: Number (%) of GPs (n = 500)* with all drugs, doctor's bag drugs, and those used for the 10 most common emergencies (shaded)

Drug	Practices
Adrenaline†	498 (100%)
Aminophylline	301 (60%)
Aspirin	468 (94%)
Atropine†	469 (94%)
Benzotropine†	372 (74%)
Dextrose	347 (69%)
Diazepam†	497 (99%)
Ergometrine	343 (69%)
Fruzemide†	491 (98%)
Glucagon†	468 (94%)
Halopendol†	443 (89%)
Hydrocortisone†	488 (98%)
Lignocaine†	463 (93%)
Morphine†	475 (95%)
Naloxone†	439 (88%)
Penicillin†	491 (98%)
Pethidine†	475 (95%)
Metoclopramide† or prochlorperazine†	498 (100%)
Promethazine†	492 (98%)
Salbutamol†	487 (97%)

* Incomplete data were recorded from 12 GPs.

† Doctor's bag drugs.

DISCUSSION

Our study, which complements the work of previous researchers,^{2-4,6,13,22,23} shows that general practice is a vital part of the health system response to medical emergencies. About 95% of GPs saw at least one patient (median, eight patients) per year potentially requiring resuscitation. Non-metropolitan practitioners saw 30% more emergencies than metropolitan GPs. However, only 67% of practices were estimated to carry all the equipment items we considered essential for the resuscitation of medical emergencies. Most practices were generally better equipped with emergency drugs than with basic resuscitation equipment, and group practices were significantly better equipped than solo practices.

In GP sample surveys, response and sampling bias can compromise the validity of the results. Our response rate of 57% compares favourably with the mean response rate of 61% for 26 original research studies published in the *British Journal of General Practice* from January 1991 to June 1993.⁷ However, the non-response rate of 43% may affect the generalisability of our results.

We minimised sampling bias by using a population list of GPs and selecting GPs by a stratified random sampling

process. Participants' demographic characteristics were comparable with the AIHW (Queensland) data⁵ for sex, hours worked per week and geographic data. Although we requested a stratified sample to include 20% non-metropolitan GPs, in accordance with national AIHW data, Queensland AIHW data estimate that 30% of Queensland GPs practise in non-metropolitan areas, which our sample achieved.

Significant differences emerged for practice size and age. Although possibly a result of response bias, the greater proportion of solo practices in our sample (compared with the AIHW data) is most likely owing to our systematic inclusion of only one GP from any given practice address. Given the strongly positive association between middle age and solo practice, the difference in age distribution is also most likely a reflection of this sampling strategy.

Another potential threat to the validity of results in these studies is measurement error. As emergencies in general practice are relatively rare, satisfactory event numbers require retrospective data collection over a long period, thereby introducing the potential for recall bias. However, because of the stressful nature of life-threatening emergencies, most of these experiences

would be recalled, although the event may be recalled more accurately than its date, with possible inclusion of emergencies outside the previous 12 months. We do not believe the magnitude of the consequent error would affect our overall conclusions.

Measurement error may also affect classification of identified emergencies. The questionnaire list of emergencies, although reasonably comprehensive, is not complete. Six per cent of GPs documented low frequencies of 33 other types of emergencies (eg, snakebite, severe burns, epiglottitis), and it is possible that some GPs omitted recording their "other" emergencies, leading to under-representation of the size of the problem. Further, GPs may have had trouble categorising the emergencies, resulting in an accurate report of the total number of emergencies, but a possible classification error of the type of emergencies.

Although some recent publications have recommended appropriate drugs to be included in the doctor's bag,^{13,24} there are currently no formal guidelines specifying the minimum requirements for emergency equipment and drugs in general practice in Australia. The RACGP's Standards for General Practices mention only three items of equipment relevant to managing emergency presentations, and, for drugs, state only that any perishables kept on site should be within their expiry date.²⁰ Our data showed that general practices are relatively better equipped with emergency drugs than with emergency equipment, perhaps reflecting the Commonwealth Government's provision (free of charge) to GPs of the emergency drugs listed in its doctor's bag supply scheme.²¹

Our study of general practice emergencies provides information to support health service planning and development, and can usefully form the basis of new initiatives. If an average of 11.6 serious medical emergencies are managed by an estimated 19 211 Australian GPs,⁵ then more than 220 000 emergencies potentially requiring resuscitation may be managed by Australian GPs annually. Clearly, this represents an important contribution to the health of the nation and needs to be recognised when valu-

ing the work of GPs and planning education, training, and practice resources.

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