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Clinical paper

Epinephrine use in older patients with anaphylaxis: Clinical outcomes and cardiovascular complications☆

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ABSTRACT

Background: There is little data describing the differences in epinephrine (epi) administration and cardiac complications among older and younger patients with anaphylaxis.
Methods: This retrospective cohort study was conducted at two urban emergency departments (ED) over a 5 year-period, and included adults who met a pre-specified criteria for anaphylaxis. Patients ≥50 years of age were defined as "older". Univariate logistic regression was performed to compare the difference in frequency of epi administration between the "older" and "younger" groups. Among those who received epi, the proportion of patients who received doses exceeding the recommended maximum and who had pre-specified cardiovascular complications were compared between the two groups, stratified further by route of administration.
Results: Of 2995 allergy-related visits, 492 met criteria for anaphylaxis, including 122 (24.8%) older patients. Older patients were less likely to receive epi injection (36.1% vs. 60.5%). Of those who received epi, older patients were more likely to receive excessive dose of epi (7/44, 15.9% vs 2/225, 0.9%, unadjusted OR 20.7, 95% CI 3.8–211.7). Four (4/44, 9.1%) older patients experienced cardiovascular complications, compared to 1/225 (0.4%) in the younger group (unadjusted OR 22.4, 95% CI 2.1–1129.8). When examining only intra-muscular epinephrine, 1/31 older patients had cardiac complications, compared to 1/186 in the younger group.
Conclusion: Older patients with anaphylaxis were less likely to receive epi injection. Intramuscular epi appears safe in this population; however, the use of intravenous epi should be avoided in older patients due to the potential of developing serious cardiac complications.

Introduction

Anaphylaxis is defined as "a serious allergic reaction that is rapid in onset and may cause death".[1,2] Although the lifetime prevalence is estimated to be low with a range from 0.05 to 2%, the prevalence appears to be rising.[3,4] Allergic reactions and anaphylaxis account for approximately one percent of emergency department (ED) visits.[5]

Older patients have been identified as a vulnerable group for severe or fatal anaphylaxis.[6] Despite this older patients appear less likely to receive epinephrine (epi) injection, possibly due to concern for its side effects.[7,8] It is unclear, however, whether epi use is associated with a higher frequency of side effects in older patients with anaphylaxis.

We conducted a retrospective cohort study at two urban EDs to compare the frequency of epi administration and the subsequent documented cardiovascular complications in patients with

Abbreviations: ED, emergency department; CABG, coronary artery bypass graft; PCI, percutaneous coronary intervention; sBP, systolic blood pressure; IV, intravenous; IM, intra-muscular; ECG, electrocardiogram; IQR, interquartile range; OR, odds ratio; CI, confidence interval.

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anaphylaxis, and compared patients 50 years and older, with their younger counterparts.

Methods

Design and setting

This retrospective cohort study was conducted at two urban academic teaching hospitals in Vancouver, British Columbia, Canada, affiliated with the University of British Columbia. St. Paul's Hospital is a tertiary care referral center that treated approximately 70,000 ED patients annually during the study period. Mount St. Joseph's Hospital is a community center with nearly 25,000 annual ED visits. The two hospitals share a common comprehensive electronic medical record (Eclipsys sunrise clinical manager, Allscripts Healthcare Solutions Inc., Chicago, IL). All medical treatments, diagnostic investigations, consultations and outpatient prescriptions are recorded with digital time stamps. Emergency physicians complete an electronic summary with at least one diagnosis for every encounter. The study hospitals are located in a region with four additional EDs; all visits are recorded in a unified database, and patient visits can be linked with unique provincial health numbers. This study protocol was approved by the institutional review boards and affiliated ethics committees of Providence Health Care, the University of British Columbia, and Vancouver Coastal Health.

The provincial B.C. Ambulance Service provides prehospital care. Paramedics are licensed to administered intramuscular epi in accordance with provincial guidelines,[9] although corticosteroid administration is not within their scope of practice. In the ED patients were managed at the discretion of the treating physician. ED treatment protocols indicate that all patients who receive epi must have cardiopulmonary monitoring in a nurse-staffed stretcher. Electrocardiograms (ECG's) are ordered by physicians or nurses if patients develop chest pain. In addition, ancillary testing such as chest radiographs and cardiac troponins are also typically ordered in these cases.

Inclusion and exclusion criteria

All patients from April 1, 2007 to March 31, 2012, with an ED discharge diagnosis of "allergic reaction" (ICD 9 code 995.3), which was the only available allergy-related code for physicians within the electronic medical record, were collected. The following patients were excluded: those younger than 17 years, those with a primary diagnosis of asthma, those who left prior to assessment by a nurse or a physician, those whose allergen was considered to be an angiotensin-converting enzyme (ACE) inhibitor (due to potential misclassification with ACE-induced angioedema), and those who had a past history of non-allergic angioedema. We performed a comprehensive chart review of each patient and applied a definition of anaphylaxis using a previously described, adapted from the National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network criteria (Fig. 1).[1,10,11]

Methods of measurements

Data collection adhered to robust methodologic standards for chart reviews and has been described previously.[10–13] Briefly, three investigators (J.L., T.W.Y., and B.G.) who were unaware of the hypothesis and outcomes of this study, systematically abstracted data using a standardized collection form after training on a set of 50 records. Weekly meetings were held to monitor performance and resolve disagreements. Study investigators collected the following data: demographics, past medical history, characteristics of presentation, treatment with epi injection (self-administered, intra-muscular or intravenous epi, and whether administration occurred in the prehospital setting and ED), length of ED stay, (LOS) and disposition (home, death, or the admission to hospital). The definition of anaphylaxis, severe anaphylaxis, and biphasic reaction were applied to each patient encounter (Fig. 1).[14] LOS was defined as the time period from ED registration to discharge, whether or not the patient was admitted. Overall, five percent of patient charts were randomly identified and reviewed by a second blinded reviewer; inter-observer agreements have been reported previously with all kappa {κ} values >0.9.[10,11] In all cases, missing data were noted in the collection form and undocumented variables were considered not to be applicable to the patient encounter.

An additional investigator (TK) collected data pertaining to cardiac risk factors, prior history of angina, myocardial infarction, and revascularization. Two independent abstractors (TK, FS) reviewed all potential cardiac complications (see below); in cases of disagreement, a third reviewer, blinded to both initial reviews (B.G.), adjudicated.

Outcome measures

The primary outcome of interest was the proportion of patients who were treated with epi. The secondary outcome was the proportion of patients with pre-specified post-epi cardiovascular complications; this was further classified by route of administration; intravenous (IV) or intramuscular (IM). The tertiary outcome was the proportion of patients who received an excessive dose of epi, defined as greater than 0.5 mg for intramuscular, or greater than 100 μg for intravenous administration, respectively.[6,15–17]

Cardiovascular complications after epi injection were defined as follows: (1) new onset of ventricular fibrillation or tachycardia, atrial flutter or fibrillation, or multifocal atrial tachycardia; (2) acute stroke, defined as a new neurologic deficit[18]; (3) elevated cardiac troponin T (above 99th percentile of the upper reference limit (normal sensitivity troponin, Roche Elecsys, Hoffman Laroche, Laval, QC; 99th percentile reference limit > 0.01 ng/ml)); and, (4) the following new ischemic ECG findings: ST-segment elevation greater than 1 mm, ST-segment depression greater than 0.5 mm; left bundle branch block; T-wave inversions, or pathological Q-wave changes.[19]

Seven-day outcomes were obtained by cross-referencing the patient list with the regional ED database to determine subsequent ED visits (classified as allergy-related or unrelated) and the provincial vital statistics database to ascertain mortality.

Statistical analysis

All analyses were performed using STATA version 13.1 (STATA Corp., College Station, TX). Categorical variables are presented as percentages and non-normally distributed continuous variables as medians with interquartile ranges (IQR). In order to demonstrate the linear trend between the proportion of epi treated patients and the age, we divided patients into age categories (17–29 years, 30–39 years, 40–49 years, 50–59 years, 60–69 years, and 70 years and older), and analyzed with the Cochran–Armitage test.[20]

Study patients were dichotomized by age: older patients were defined as those 50 years of age and older, based on previous literature.[7] We assessed unadjusted associations of each variable between two groups by using Mann–Whitney *U* test, univariate logistic regression, or Fischer exact test, where applicable. To compare the primary outcome between older and younger patients, we conducted univariate logistic regression. For the analysis of the secondary and tertiary outcomes, we conducted univariate exact logistic regression to estimate the odds ratio (OR) with corresponding 95% confidence intervals (CI) for each association. Due to the rarity of events, relative risk calculations were not performed.[18]

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Anaphylaxis: Any of the following three numbered criteria must be satisfied:

1. Both of the following must be satisfied:
   a. skin or mucosal tissue involvement
   b. one of the following:
      i. Respiratory compromise
      ii, Systolic blood pressure (sBP) < 90 mm Hg or syncope

2. Two of the following must be satisfied after exposure to a "likely" allergen:
   a. Skin or mucosal tissue involvement
   b. Respiratory compromise
   c. sBP < 90 mm Hg or syncope (concurrent to other symptoms)
   d. Gastrointestinal symptoms

3. sBP < 90 mmHg after exposure to a known allergen.

Skin Involvement: Urticaria, rash, pruritus, or swelling of the face or err, Localized pruritus or rash that was deemed the result of trauma or an obvious insect bite was not considered as fulfilling the definition of "skin involvement."

Mucosal tissue involvement: Swelling of lips, tongue or pharynx.

Respiratory compromise: Wheeze or stridor on auscultation, hypoxemia (oxygen saturation < 95%) or respiratory rate > 22 breaths / min.

Gastrointestinal Symptoms: Abdominal pain or vomiting that is present in the ED.

Neurological Symptoms: confusion, collapse, loss of conscious, syncope or incontinence.

Known Allergen: A substance that had previously caused an allergic reaction to the patient.

Likely Allergen: A substance that (1) the patient was exposed to before the development of symptoms+ (2) was deemed the cause of the allergic reaction by the attending physician; and (3) had not previously caused a known reaction.

Severe case of Anaphylaxis : Patients experienced hypotension (sBP<90), oxygen saturation < 92% and/or neurological symptoms.

Biphasic Reaction: Recurrent or new signs or symptoms occurring after an initial allergy related presentation that satisfy the definition for anaphylaxis, without any obvious further exposure to an offending allergen. If certain signs or symptoms were present on the index visit and did not resolve or improve before the subsequent visit, they were not considered "recurrent" or " new" and thus were not used in the classification of biphasic reaction in subsequent visit.

Fig. 1. Definition of anaphylaxis, severe case of anaphylaxis and biphasic reaction.

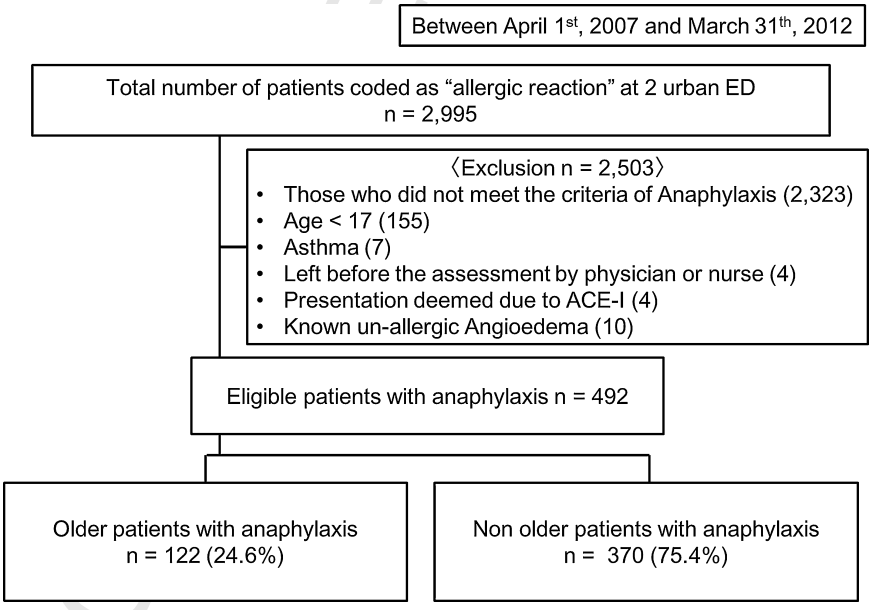

Fig. 2. Recruitment diagram involved 492 patients with anaphylaxis managed at two Vancouver area emergency departments.

Results

During the study period, 2995 patients had a discharge diagnosis of "allergic reaction" at the two sites, and 665 (22.2%) were over the age of 50. A total of 492 eligible patients, including 122 (24.8%) older patients, had anaphylaxis (see Fig. 2). Inter-observer agreements (κ) of secondary review for risk factors for coronary disease were as follows; CABG, PCI, and angina, 1.00 (95% CI 0.86 to 1.00); myocardial infarction, 0.96 (95% CI 0.80–1.00). Four patients (0.8%) did not have provincial health numbers and follow-up information could not be obtained.

Patient demographics and patient characteristics are detailed in Table 1. The offending allergen for older patients was more likely to be a drug, and less likely to be food. Although older patients

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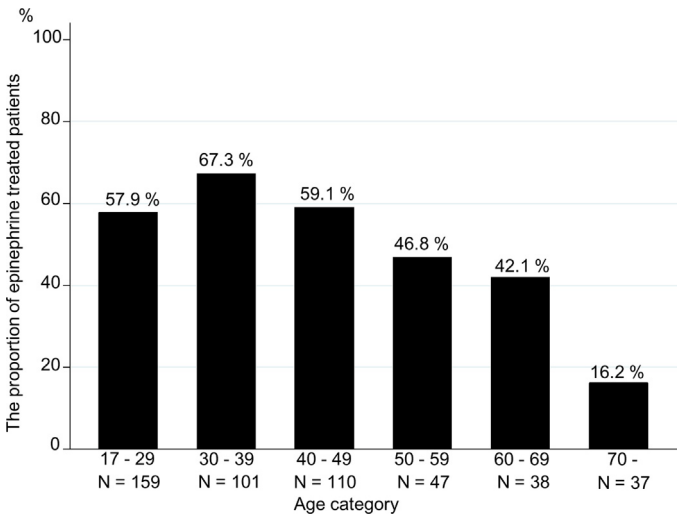

Fig. 3. The relationship between the proportion of epinephrine treated patients and age category.

were more likely to report risk factors for coronary disease and present with neurological symptoms, a similar proportion of older and younger patients had sBP <90 mmHg upon presentation.

Table 1 shows the proportion of patient with severe anaphylaxis and biphasic reactions, as well as length of ED stay, disposition, and 7-day ED revisits or death. A statistically greater proportion of older patients were admitted to hospital and they had a higher probability of an allergy-related ED revisit within 7 days, but there were no deaths in either group.

When analyzing epi administration by increasing age, the proportion of treated patients decreased significantly as age category increased: 57.9% of patients 17–29 were treated, and 16% of patients >70 ($p < 0.01$ for trend; Fig. 3) (Table 2).

Primary outcome

Of the 492 patients, 269 (54.7%) received epi: 44/122 (36.1%) older patients and 225/370 (60.8%) younger patients (unadjusted OR 0.3, 95% CI 0.2–0.5). Older patients were more likely to receive intravenous epi (5/122 vs 2/370).

Secondary and tertiary outcomes

Post-epi cardiovascular complications are described in Fig. 4. Of the five patients, four were over 50, for an unadjusted OR of 22.4, 95% CI 2.1–1129.8, (Table 3).

When examining patients who received epi, classified by route, the intravenous (IV) group was more likely to have cardiac complications than the intra-muscular (IM) group (IV: 42.9% [3/7] vs IM: 0.9% [2/217], unadjusted OR 99.6, 95% CI 7.4–∞). Of these complications 3/3 of the IV group, and 0/2 of the IM group involved excessive dosing. Among those treated with IM epi, the proportion of cardiovascular complications among those older and younger were 1/31 and 1/186 respectively (unadjusted OR 1.09, 95% CI 0.65–∞). Neither involved excessive dosing.

Overall, 9/269 (3.3%) patients were dosed with excessive epi: 7/44 (15.9%) older patients and 2/225 (0.9%) younger patients (unadjusted OR 20.7, 95% CI 3.8–211.7).

Discussion

In this retrospective cohort of 492 patients with anaphylaxis, approximately one-quarter were fifty years of age or older. Although epi was administered in over half the patients,

- 41-year-old man without prior allergy history was transported to ED by ambulance (EMS) with angioedema, body rash, and a blood pressure of 90 / 50. This was deemed anaphylaxis and EMS personnel treated him with 300 μg intramuscular epinephrine. Laboratory testing showed incidental hypokalemia, and an EKG performed in response to this showed ST-T depression in V4-5 with sinus tachycardia. This finding was still evident on his second ECG with normal rhythm. The patient never developed chest pain or dyspnea. He discharged uneventfully from the ED, did not visit any regional EDs within 7 days, and did not appear in the mortality lists.

- 50-year-old man with known penicillin allergy presented to the ED after almond ingestion, with rash, mucosal swelling and wheeze. This was deemed anaphylaxis, and he was treated with 150 μg of intravenous epinephrine*. Immediately post-administration, the patient experienced 3 minutes of ventricular tachycardia, which spontaneously resolved. After 2 hours of observation, he was discharged uneventfully, and did not re-present to a regional ED or appear on the mortality lists within 7 days.

- 51-year-old male heroin user presented to ED with periorbital and mucosal swelling, tachypnea, diffuse rash to the body, and decreased SpO2 with unknown allergic precipitant: this was deemed to be anaphylaxis. He was treated accidently with 300 μg of intravenous epinephrine.* He had chest discomfort with new onset of rapid atrial fibrillation on the monitor but, regained sinus rhythm before he underwent his first ECG. His first ECG showed slight ST-T depression on V4-6 with sinus tachycardia, but it was resolved on his second ECG After 5 hours of observation, he was discharged without any complications; 3 days post-ED visit, he underwent a normal exercise stress test. .

- 54-year-old HIV-positive male with a known penicillin allergy presented to ED, with nausea, total body rash, mucosal swelling, and mild wheezing after ingestion of trimethoprim–sulfamethoxazole for presumed pharyngitis. He was treated with 300 μg intramuscular epinephrine, after which he complained of 2-3 / 10 chest pain. His EKG showed ST-T depression on V4-5, which remained even after his chest pain resolved without any additional therapy. After 6 hours ED observation, he was discharged home uneventfully, and did not revisit any regional EDs or appear on the provincial mortality list within 7 days.

- 58-year-old woman with known sulfite, penicillin, and acetaminophen allergy and no history of coronary disease, went into respiratory distress after seafood ingestion. Upon EMS arrival she was found to have a Glasgow Coma scale of 6 with extensive urticaria and shallow respiration. She was intubated on the scene. At ED arrival she was treated with 300 μg intravenous epinephrine* followed by continuous epinephrine infusion. ECG showed ST depression in V4-5 with sinus tachycardia, which resolved at her second ECG 1 hour later. She was admitted to the intensive care unit and had a slight troponin rise on day 2 without any new ischemic change in ECG. She underwent a cardiac CT that demonstrated no coronary stenosis. She was discharged from hospital on post-admission day 7.

Fig. 4. Five patients with anaphylaxis who developed to cardiovascular complication after epinephrine injection.

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Table 1
Q7 Patient demographics of 492 patients with anaphylaxis managed at two Vancouver area emergency departments.

Variable	Older patients (n = 122) n or Median	Younger patients (n = 370) n or Median
Age (IQR), y	62 (56–71)	31 (25–41)
Female sex (%)	57 (46.7)	208 (56.2)
History of allergies (%)	83 (68.0)	273 (73.8)
History of asthma (%)	17 (13.9)	108 (29.3)
Ambulance arrival (%)	40 (32.8)	118 (31.9)
Known/suspected allergy		
Drug (1/0) (%)	48 (39.3)	66 (17.8)
Food (1/0) (%)	31 (25.4)	189 (51.1)
Other (1/0) (%)	14 (11.5)	39 (10.5)
Allergen unknown (%)	29 (23.7)	76 (20.5)
Risk factors for Cardiac complication		
Total number of patients with risk factors (%)	8 (6.5)	1 (0.3)
History of CABG (%)	2 (1.7)	0
History of PCI (%)	0	0
History of Angina (%)	1 (0.8)	1 (0.3)
History of Myocardial infarction (%)	5 (4.1)	0
Vital signs and symptoms		
Lowest sBP (IQR), mmHg	115 (99–132)	110 (100–122)
sBP <90 mmHg, (%)	17 (13.8)	45 (12.2)
Highest respiratory rate (IQR), bpm	20 (18–24)	22 (20–24)
Respiratory rate >22 bpm, (%)	40 (39.6)	195 (49.4)
Lowest oxygen saturation (IQR), %	95 (94–97)	97 (94–98)
Oxygen saturation <95%, (%)	56 (45.5)	98 (26.5)
Skin involvement (%)	108 (88.5)	331 (89.5)
Mucosal tissue involvement (%)	33 (27.1)	107 (28.9)
Respiratory compromise (%)	25 (85.3)	131 (86.5)
Gastrointestinal symptoms (%)	7 (5.7)	55 (14.9)
Neurological symptoms (%)	15 (12.3)	15 (4.1)
Severe anaphylaxis (%; 95%CI)	33 (27.1; 19.4–35.8)	79 (21.4; 17.2–25.9)
Biphasic reaction (%; 95%CI)	0 (0; 0–2.4)	2 (0.5; 0.1–1.9)
Length of ED stay (IQR), hours	3.0 (2.1–4.9)	2.8 (1.9–4.1)
Disposition		
Home (%; 95%CI)	116 (95.9; 79.2–114)	368 (99.5; 90.0–110)
Death at ED (%; 95%CI)	0 (0; 0–2.4)	0 (0; 0–0.8)
Admission (%; 95%CI)	5 (4.1; 1.3–9.3)	2 (0.5; 0.1–2.0)
Subsequent visit within 7 days after the index visit		
Allergy related visit (%; 95%CI)	13 (10.7; 5.8–17.5)	12 (3.2; 1.7–5.6)
Not-allergy related visit (%; 95%CI)	10 (8.3; 4.0–14.6)	23 (6.2; 3.9–9.2)
Subsequent death (%; 95%CI)	0 (0; 0–2.4)	0 (0; 0–0.8)

Older patients: patients who were aged 50 years and older.
Abbreviations: CABG: coronary artery bypass graft, PCI: percutaneous coronary intervention, sBP: systolic blood pressure. IQR: interquartile range. CI: confidence interval. ED: emergency department.

Table 2
The number of anaphylactic patients treated with epinephrine injection, spilt by age groups.

	Older patients (n = 122)	younger patients (n = 370)		
	n	n	OR	95% CI
Treatment				
Total epinephrine used (%)	44 (36.1)	225 (60.8)	0.4	0.2–0.6
Self-administered epinephrine (%)	9 (7.4)	43 (11.6)	0.7	0.3–1.3
IM injection (%)	31 (25.4)	186 (50.3)	0.3	0.2–0.5
Over dose of IM epinephrine (%)	2 (6.5)	1 (0.2)	–	
IV injection (%)	5 (4.1)	2 (0.5)	14.1	2.2–152.6
Over dose of IV epinephrine (%)	5 (4.1)	1 (0.2)	–	
Total dose of epinephrine (IQR), mg	0.3 (0.3–0.5)	0.3 (0.3–0.3)	–	

Older patients: patients who were aged 50 years and older.
Abbreviations: IM: intra-muscular. IV: intravenous. IQR: interquartile range. OR: odds ratio. CI: confidence interval.

Table 3
Cardiovascular complications among patients with anaphylaxis who were received at least one epinephrine injection.

Cardiovascular complications	Older patients with epinephrine injection (n = 44) n	Younger patients with epinephrine injection (n = 225) n
Total number of patients with cardiovascular complications (%; 95% CI)	4 (9.1; 2.5–21.7)	1 (0.4; <0.1–2.5)
Ventricular fibrillation/tachycardia/ atrial fibrillation (%; 95% CI)	2 (4.5; 0.6–15.5)	0
Ischemic ECG (%; 95% CI)	3 (6.8; 1.4–18.7)	1 (0.4; <0.1–2.5)
Elevated serum troponin T values (%; 95% CI)	1 (2.2; 0.1–12.0)	0
Stroke (%; 95% CI)	0	0
Route		
IV (% excessive)	3 (100)	0
IM (% excessive)	1 (0)	1 (0)

Older patients: patients who were aged 50 years and older.
Abbreviations: CI: confidence interval. IM: intramascular. IV: intravascular.

treatment was significantly less likely in older patients, and this trend was most evident among the oldest patients. Overall, cardiovascular complications among those treated with intramuscular epi administration were rare in both young and old patients. Excessive epi dosing—which only occurred with intravenous dosing—was rare but more common in older patients and occurred in most of the observed cardiac complications. These data assist clinicians by highlighting missed opportunities for epi administration in older patients with anaphylaxis, as well as supporting the safety of intramusclar epi.

It is unclear why fewer older patients received epi; this might be attributed to clinician reluctance regarding potential cardiovascular complications.[8] Our results suggest that intramuscular epi is safe in both old and young patients. In a study of 297 patients with anaphylaxis, Campbell reported adverse cardiac events in 8.4%, although using a slightly different definition.[18] Similarly, Cydulka et al. reported that older asthma patients treated with subcutaneous epi had a similar adverse event (2.6%) profile to younger patients (1.4%).[8]

Campbell and co-workers examined differences between age categories among 220 anaphylaxis patients.[7] While older patients were more likely to be hypotensive at presentation, they demonstrated that a lower proportion of older patients received epi, which is congruent with our results.[7] In our study, older patients were more likely to be hospitalized and have unscheduled subsequent ED revisits. Although the reasons behind these differences were not a focus of this study, they are likely multifactorial, and consistent with previous studies,[7,21] which illustrates the need for caution among this patient population.

Although the vast majority of patients with anaphylaxis were treated appropriately, 6/9 excessive dosing cases in our study occurred in patients treated with intravenous epi injections. Interestingly, older patients were more likely to receive intravenous epi, and all received an excessive dose. The reasons behind this remain unclear since there was no statistically significant difference in the proportion of severe cases and hypotension between older and younger patients with anaphylaxis in this study. In a previous study, an excessive dose of epi was administered to 11.8% (4/34) of

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patients.[18] However, older patients who received excessive doses of epi had a higher proportion of cardiovascular complications in both studies.[18] The existing evidence suggests that intravenous epi should be avoided, particularly in the elderly.[6]

Potential limitations

First, this study was conducted at two urban Canadian EDs where predefined protocols for anaphylaxis were not established, and our findings may not be generalizable. Second, this is a retrospective study and undocumented or unmeasured variables may have underestimated the proportion of those with anaphylaxis; however, robust methods were used to ensure valid data collection. The overall cohort was identified from those with a discharge diagnosis code of "allergic reaction", which was based on subjective clinical impression. Thirdly, we defined cardiovascular complications including ventricular arrhythmias, ischemic ECG findings, elevated serum troponin T values, and stroke; however, a patient would have to be symptomatic to trigger such investigation, and silent events might have been missed. Importantly, it is possible that physicians refrained from administering epi in those with cardiac disease or cardiac risk factors, thus avoiding adverse events; this would lead to an underestimation of the true proportion of post-epi complications. However, current evidence suggests that intramuscular epi is safe in all patients with anaphylaxis, and there is no specific exception for older patients or those with cardiac disease.[6] Finally, the relatively small number of the outcomes in this study limited the statistical power to detect significant associations and perform multivariate analyses, and multiple hypothesis testing might result in unreliable p values.

Conclusions

In this retrospective study of 492 patients with anaphylaxis at two urban EDs, older patients with anaphylaxis were less likely to receive epi injection. Intramuscular epi appears safe; however, the use of intravenous epi should be avoided (especially in older patients) due to the potential of developing serious cardiac complications. Our data support current recommendations for administration of IM epi to anaphylactic patients including those who are older ages.

Commentaries

We report the differences in management, and clinical outcomes between older (50 years and older) and younger patients with anaphylaxis, specifically examining epinephrine by a retrospective analysis of 492 patients with anaphylaxis at two urban emergency departments in Canada. We found that older patients with anaphylaxis were less likely to receive epinephrine treatment. Of those who received epi, older patients were more likely to receive excessive dose of epi and experienced more cardiovascular complications, compared to the younger group. When examining only intra-muscular epinephrine, these complications were few in either of groups (older patients: 1/31, younger patients: 1/186).

Conflicts of interest statement

The authors have no conflict of interest to report regarding this study.

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Author contribution

T.K. collected the additional data required for this study, analyzed the data and wrote the article. B.E.G. conceived and designed the original study, and supervised and participated in original dataset collection. B.H.R., R.S., E.G., and F.X.S. provided advice on study design. E.G. constructed data linkages for outcomes. R.S. provided statistical advice. All authors contributed substantially to article revision. T.K. takes responsibility for the paper as a whole.

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None should be listed other than authors.

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