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Letter to the editor

The unseen cost of falls: The environmental impact of attending falls call out by the emergency ambulance services

1. Introduction

Falls in older people are a major public health problem. This has major consequences to the individual, which can ultimately lead to injury, functional decline, psycho-social impairment and increased risk of mortality. It is also a major burden on healthcare resources. In the United Kingdom (UK), falls account for 3% (about £980 million) of the total National Health Service (NHS) expenditure [1] and the prevention of falls in older people has been highlighted as a priority area [2,3]. Older people commonly call out an emergency ambulance following a fall. This group account for 8% of emergency ambulance responses, which is similar to the proportion reported in Australia [4] and an urban Emergency Medical Service system in USA [5]. Transfer of these patients to the emergency department is also high, close to 60% and account for 60,000 of attendances in the UK [6], with similar proportions in the USA [7] and as high as 75% in Australia [4]. Previous studies examining healthcare cost of falls suggest costs of approximately £2000–£3000 per faller, with hospital costs accounting from 50% to 80% of these costs [8,9].

Global warming is becoming an increasing concern. In a natural carbon cycle, carbon dioxide is re-absorbed by plants and trees but this excess has now reached dangerous levels not seen in the last 3 million years and has led to an overall rise in atmospheric temperature-global warming. The transportation sector is the second largest source of anthropogenic carbon dioxide emissions. Transporting goods and people around the world produced 22% of fossil fuel related carbon dioxide emissions in 2010. Since the 1990s, transport related emissions have grown rapidly, increasing by 45% in less than 2 decades. Road traffic accounts for 74% of this sector's carbon dioxide emissions. Automobiles, freight and light-duty trucks are the main sources of emissions for the whole transport sector and emissions from these three have steadily grown since 1990 [10]. The NHS itself accounts for 3% of the UK's carbon footprint, which makes it a bigger polluter than some small countries [11]. The direct contribution related to the ambulance service and more specifically to falls is unknown. The aim of this study was to assess the environmental implication of falls in older people who call out an emergency ambulance.

2. Method

The East Midlands Ambulance Services (EMAS) provides emergency and urgent care to the 4.8 million people within Nottinghamshire, Derbyshire, Leicestershire, Rutland, Lincolnshire and Northamptonshire. Nottinghamshire has a population of 776,600, of which 137,900 are over the age of 65 years old [12]. Those that need emergency assessment and treatment are transferred to the Queens Medical Centre (QMC), Nottingham University Hospital. Data of category C, i.e. non-urgent emergency call outs, coded as falls in the 65 yrs and over age group was collected from 1st April – 31st December 2009. These were then divided into those patients not transported to hospital, i.e. assessment and treatment delivered by the ambulance crew at the scene and no further action taken; and those transported to hospital, i.e. following assessment by the ambulance crew, patients were transported to the QMC Emergency Department.

A random sample of those not transported and those transported to the ED were then further analysed by the Environmental Technology Centre, university of Nottingham to determine carbon emissions in kilograms of CO_2. Vehicles involved in these call outs were either accident and emergency vehicles, or incident support vehicles. As data was unavailable on the type of vehicle used in each call out, calculation of CO_2 emission was done for both types of vehicles.

For patients not transported to hospital, distance travelled by the accident and emergency vehicle; or incident support vehicles were calculated as the distance travelled from the main ambulance hub to the patient's residential address. For those transported to ED, distance travelled from the main hub to the patient's home was then added to the distance from the patient's home to ED. Residential addresses were defined using individual residential postcodes. Distance travelled was then used to estimate fuel consumption, where fuel consumption for accident and emergency vehicles and incident support vehicles to be 0.21 litre/mile and 0.23 litre/mile respectively. Each litre of fuel generates 10.8 kilowatt hours (kWh), which produces 0.25 kg CO_2 emission per kWh.

Descriptive statistics of distance travelled and fuel consumption of both groups, those transported to hospital and not transported, were used to describe characteristics of both groups. Annual CO_2 emission was calculated by extrapolating emission per call out by annual number of falls.

3. Results

Between 1st April – 31st December 2009, there were 9870 non-urgent emergency calls coded as falls, in the 65 yrs and over age group, of which 6874 (70%) were falls that occurred at the patient's own residence. Of these, 2770 (40%) were transported to ED. Based on local data, we know that the incidence of falls is constant throughout the year with no seasonal variation. This extrapolates to an estimate of almost 10,000 call outs annually from patient's residence.

A random sample total of 193 patients were examined in detail (130 not transported to ED and 63 who were transported to ED). They were attended by vehicles despatched from 9 ambulance hubs. Those not transported (assessed and treated at the incident site) had an average (SD) distance travelled of 5.0(2.0) km per patient and those transported to ED 10.6(2.9) km per patient.

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Table 1
CO_2 emission by subset analysis (not transported to hospital and transported to hospital) and vehicle type (accident and emergency vehicles and incident support vehicles).

		Not transported to ED ($n = 130$)		Transported to ED ($n = 63$)	
		Accident and emergency vehicles	Incident support vehicles	Accident and emergency vehicles	Incident support vehicles
CO_2 emission (kg)	Total for sample size	328.9	368.4	234.7	262.9
	Average per call out	2.5	2.8	3.7	4.2
	Annual projection	13,680	15,321	13,664	15,511

Table 1 describes the CO_2 emission for both accident and emergency vehicle and incident support vehicle, if either vehicle was dispatched per call out (or per older person who has suffered a fall).

If each call out was attended by an accident and emergency vehicle, over 27 tonnes of CO_2 would be emitted (transported and not transported to hospital). If the fall incident was attended by an incident support vehicle, then over 30 tonnes of CO_2 would be emitted.

4. Discussion

This study highlights the significant environmental impact of fall in older people. Over a projected 12-month period, approximately 27 tonnes of CO_2 emission was produced by ambulance vehicles attending non-urgent call related to falls. Twenty-seven tonnes of CO_2 is equivalent to filling up 36 million balloons, flying from Australia to UK and back seven times; or travelling over 81,000 miles by car.

We acknowledge that this is a relatively simplistic method of calculating the environmental impact of emergency ambulance services. Only one aspect of ambulance service (scope 1 – direct energy consumptions, i.e. use of petrol) is considered here and that other factors such as vehicle maintenance, hub maintenance or waste disposal were not analysed. Fuel consumption does not depend on the vehicle and distance travelled alone, but also the way the vehicle is driven and geographical location (average road gradient, type of road travelled and traffic condition). Nonetheless, the distance travelled by our cohort is relatively short and none of the calls would have been blue-lighted needing high-speed travel, which therefore minimises some of these confounding factors.

In recognition of the impact that the emergency ambulance services may have on the environment, steps are being taken to reduce the carbon footprint nationally. This includes better aerodynamics, more fuel efficient and low CO_2 emission engines and driver training to improve fuel efficiency. One attractive idea to reduce carbon footprint would be to introduce engines that can run on alternative fuels. Nottingham City Transport has recently introduced buses, powered by bio-ethanol engines in its strategy to reduce its carbon footprint. Compared to petrol, bio-ethanol produces almost 90% less greenhouse gasses. However, a big challenge to implementing bio-ethanol vehicles is the operating cost, which is higher than diesel powered engines.

Hence, strategies to address falls will play its part in reducing the carbon footprint. The NHS in recognition of its impact on the environment produced a report with the aim of reducing its carbon emission as part of a broader sustainable development agenda [13,14]. Although it does not explicitly address ambulance service provision, the environmental impact it has cannot be denied.

5. Conclusion

Carbon emission is very high in response to falls call outs. With the rise in the ageing population, it is expected that this will translate into more call outs to address this. Therefore, strategies need to be put in place to address this important environmental issue.

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