Rural and Remote Health rrh.org.au
James Cook University ISSN 1445-6354

ORIGINAL RESEARCH

Does driving using a Green Beacon reduce emergency response times in a rural setting?

AUTHOR

Tom Mallinson[1] MRCGP (2020), Prehospital Physician *

CORRESPONDENCE

*Dr Tom Mallinson tannim@hotmail.com

AFFILIATIONS

[1] BASICS Scotland, Sandpiper House, Aberuthven, Auchterarder, PH3 1EL, Scotland, UK

PUBLISHED

6 October 2020 Volume 20 Issue 4

HISTORY

RECEIVED: 14 May 2020

REVISED: 22 August 2020

ACCEPTED: 28 August 2020

CITATION

Mallinson T. Does driving using a Green Beacon reduce emergency response times in a rural setting? Rural and Remote Health 2020; 20: 6114. https://doi.org/10.22605/RRH6114

ETHICS APPROVAL

Exempt: The research methodology was assessed using the UK Medical Research Council tool (MRC, 2020) and was judged to not require formal NHS Research Ethics Committee approval

ABSTRACT:

Introduction: Green Beacons are used by many doctors across the UK when responding to emergencies, particularly in rural areas. These are used to alert other road users to the doctor's urgent need to reach a destination, with the hope that members of the public will make provisions for the doctor to make progress unhindered. While such warning lights have been used for many years, there is a paucity of research into the safety and efficacy of their use. This pilot study aimed to explore whether the use of Green Beacons does lead to reduced response times in rural areas of Scotland, and recorded any accidents occurring during such emergency response journeys.

Methods: A repeated measures design was devised to investigate this question. The response times and distances travelled for 10 consecutive emergency journeys undertaken by a rural primary care and prehospital doctor during the winter of 2019 using Green Beacons were recorded. The same journeys were then repeated, at a later date by the same driver, under normal driving conditions, with no Green Beacon use. Travel times were compared for both journey types.

Results: Travel times were on average 4 minutes shorter when responding using Green Beacons (range 0–13 minutes), with statistically significantly faster average speeds during the emergency response journeys. There was a trend towards higher average speed with longer journeys. No accidents occurred during either type of journey.

Conclusion: The use of Green Beacons when responding to

emergencies in rural Scotland appears to reduce journey times and appears safe in this exploratory work. This is in keeping with other researchers' work into the use of blue and red emergency vehicle lighting, and does not dissuade from continuation of current practice among doctors in the UK. Further research in this area would benefit from a larger dataset, and quantitative time–motion data from the vehicles involved.

Keywords:

ambulance, emergency medical services, response driving, Scotland, vehicle driving.

FULL ARTICLE:

Introduction

Green Beacons have for many years been used by doctors responding to emergencies in the UK[1]. They are often included in lists of recommended equipment for doctors responding to accidents or emergencies[2,3], or even as basic or essential items[4,5]. However, concerns have been raised about whether members of the public are aware of the meaning of Green Beacons and whether this lack of knowledge potentially results in confusion[1,6]. Warden[6] reported concerns about the perceived poor visibility of Green Beacons during daylight operations, although hopefully this is less of a problem with modern, high intensity lighting. A further concern was raised on the introduction of such lights: if they were used near a port or waterway, a mariner may mistake a doctor's Green Beacon for a navigational aid[7], although to the author's knowledge this has not posed a problem in the intervening 40 years.

Currently Green Beacons are used across the UK by doctors responding to emergencies, to alert other road users to their intentions and to facilitate their safe onward progress through traffic. Such doctors may be responding on behalf of the local ambulance service, another organisation such as Mountain Rescue, or in their role as a primary care doctor. Green warning lights are used internationally in a number of settings; for example, in Australia they may be seen on command vehicles while in Sweden green is only used on medical command vehicles; in the USA they are used for some community first responders and in Canada by both security services and emergency service volunteers, while in Argentina and Colombia ambulances may be fitted with green warning lights[8]. In New Zealand, green warning lights can be used by nurses, doctors and midwives on emergency calls, in a similar way to use by medical doctors in the UK[8].

The UK's Road Vehicles Lighting Regulations 1989 allow for Green Beacons to be used by any medical practitioner registered with the General Medical Council. The use of Green Beacons fitted to a car does not allow for any exemptions to road traffic law, such as exceeding the speed limit or ignoring traffic lights or stop signs[9]. Concerningly, however it has previously been identified that doctors using Green Beacons have ignored speed limits and other traffic laws when attending an emergency, with some of these actions resulting in legal sanctions, accidents or prosecutions[10]. Such behaviour cannot of course be advocated and goes against professional guidance issued by UK prehospital care organisations[9].

It has been hypothesised that in rural areas, where restrictions to emergency driving such as slow speed limits and traffic lights are sparse, the use of Green Beacons may afford a significant advantage to a responding doctor, allowing smooth and rapid progress to an emergency[11]. There is no current published work providing data in relation to the use of Green Beacons and emergency response times, or in terms of their safety. This exploratory pilot study aimed to investigate this area of established prehospital practice using a simple repeated measures design. The primary research questions asked if the use of Green Beacons improves emergency response times in a rural setting, and whether the use of green beacons is safe.

Methods

A repeated measures design was utilised, with no change to standard practice when responding to emergencies. A rural physician who regularly responds on behalf of the local ambulance service in rural Scotland recorded data from 10 consecutive activations for emergency (999) calls in the winter of 2019. Activations that ended in a stand-down message were excluded, as were self-activations ('running calls'). Calls where the ambulance dispatch device did not register the input for 'At Scene' were also excluded. Distances from site of activation to destination were recorded using data from the Google Maps platform. Start and finish times were taken from the ambulance dispatch device for the emergency journeys. All emergency calls included in this study were responded to using a roof-mounted Green Beacon, in the same vehicle. The same journeys were subsequently repeated in the same vehicle, without use of the Green Beacon, at a similar time of day. The duration of these journeys was recorded on a stopwatch. Average speeds were calculated by dividing distance travelled by time taken, this being the same method used in a similar study conducted in London[12]. The research methodology was assessed using the UK Medical Research Council tool and was judged to not require formal National Health Service Research Ethics Committee approval[13].

Results

This study was initially devised to involve 20 consecutive activations from the ambulance service. Unfortunately, this was disrupted due to the COVID-19 pandemic, and subsequent lockdown and disturbance to daily routines. Presented here are the first 10 eligible activations, which all occurred before the pandemic affected normal practices. The average distance for these calls was 9.8 miles (15.8 km) (range 0.7–30 miles). It is important to note that self-activations, where the doctor came across an incident or accident, were not included, because no Green Beacon use occurred on these occasions. Average speed when responding to calls was 38.9 mph (62.6 km/h) (range 14–56.3 mph, standard

deviation (SD) 15.76) compared to 30.8 mph (49.6 km/h) for the control journeys (range 8–46.9 mph, SD 11.59), which represents a statistically significant difference (p=0.0042). The difference in journey times ranged from 0 minutes (both journeys of the same duration) and 13 minutes, with an average time saving of 4 minutes when driving using Green Beacons.

Maximum speed was not objectively recorded; however, the use of Green Beacons does not provide exemptions to traffic law, and speed limits were not exceeded while responding. These data show a trend towards increased average speed with increased journey length; however, this correlation does not reach statistical significance for either emergency journeys (p=0.106) or control journeys (p=0.128) within this small dataset.

Discussion

There are a number of important limitations to this study. Although the aim of this study was to evaluate the effect of the use of the Green Beacons on emergency response times in a rural setting, there were a number of other variables between the emergency journeys and the control journeys. It is highly likely that the style of driving varied between these two journey types. In this study, the responder is a trained blue light driver, having completed two training courses with statutory emergency services in emergency driving. It is likely therefore that during emergency journeys they were more likely to be driving *at* the speed limit, accelerating up to that limit faster, and manoeuvring hazards at the fastest speed felt to be safe for the prevailing conditions. During the control journeys it would be difficult to justify driving in this manner for the sole purposes of this piece of research, and thus it is likely that acceleration and deceleration would be slower and smoother and that progress was not always made *at* the posted speed limit.

Average speeds in this study were calculated as a function of distance and time, with distance being measured retrospectively on computer mapping software, and with time being measured either by the ambulance device or with the use of a stopwatch. These methods have the potential to introduce significant levels of error to the dataset.

It was felt by the researcher that it would be unethical to respond to emergency calls without the use of the Green Beacon for the purposes of this study, because it is unclear whether there is true clinical equipoise between the use and omission of emergency lights on a vehicle. As other researchers have postulated[14-16], the use of a non-emergency 'chase' or control vehicle undertaking the same route behind the emergency response vehicle is one method to address this issue, although this will be confounded by any disruption to traffic flow caused by the passage of the initial vehicle utilising emergency warning lights. In this study, a 'chase' vehicle was not practicable, and repeat drives of the same route were undertaken instead. These repeat drives (control journeys) were undertaken without the activated Green Beacon but unfortunately were not at the exact same time of day nor day of the week as the original emergency call. This is due to the researcher being otherwise engaged in clinical work and unable to leave to undertake a repeat journey for the purposes of this study. It is possible that this caused the control journey times to be an inaccurate comparator for the emergency journeys. Both techniques are likely to be affected by confounding variables.

The results appear to support the work of other authors that use of emergency lighting on response vehicles leads to shorter response times in both rural[15] and urban settings[14,16]. The time saved in this study appears small, albeit statistically significant, and it is unclear if such a reduction in response times is clinically meaningful or significant. Furthermore, this study did not gain specific detail about acceleration and deceleration patterns, which may in future add useful information to this discussion. Some of these sources of error could be mitigated against by using specific tracking data from the vehicle to plot its route and journey distance. Further work in this area should include the use of an accelerometer and location tracking devices to gain more accurate data in relation to these issues.

During this study period, no accidents occurred involving the responder either during emergency or control journeys; however, it is known from other sources that emergency response driving can be dangerous[17,18] and it is unclear whether the small time saving demonstrated here offsets this increased risk. A larger dataset and further information about the clinical benefit of these reduced travel times would be needed to elucidate this problem further and would provide more generalisable results. Future research would benefit from review of a video-recording of the journey by an independent driving expert, who may be able to offer insight into the safety, or risk exposure, related to the style of driving being demonstrated.

Conclusion

This exploratory study demonstrates that responding to emergency calls in a rural Scottish setting using a Green Beacon leads to faster journey times than driving without them and in a normal manner. No road traffic collisions were recorded during this short study. There are many confounding factors at play, making this a challenging area of study, and future research in this area would benefit from a larger dataset of journeys, with additional quantitative and qualitative data about driving style. This pilot study does not dissuade from the continuation of the current practice of doctors in the UK utilising Green Beacons in remote and rural areas when responding to emergencies; however, further research would be required to fully endorse this practice as safe and efficacious.

REFERENCES:

1 Whitney JD. Green flashing lights for doctors. *British Medical Journal* 1979; **1(6157):** 201-202. https://doi.org/10.1136/bmj.1.6157.201-e

2 Cox J, Mungall I (Eds). *Rural healthcare*. Oxford: Radcliffe Medical

Press, 1999.

3 Greaves I, Porter K (Eds). *Oxford handbook of pre-hospital care.* Oxford: Oxford University Press, 2007.

4 Eaton CJ. *Essentials of immediate medical care.* London: Churchill Livingstone, 1999.

5 Greaves I, Dyer P, Porter K (Eds). *Handbook of immediate care.* London: Saunders, 1995.

6 Warden J. More doctors needed at scenes of emergencies. *British Medical Journal* 1996; **313(7056):** 509. https://doi.org/10.1136/bmj.313.7056.509a PMid:8789968

7 Potter LN. Rotating lights on doctor's cars. *British Medical Journal* 1980; **280(6217):** 868. https://doi.org/10.1136/bmj.280.6217.868-b

8 Wikipedia. *Emergency vehicle lighting.* 2020. Available: https://en.wikipedia.org/wiki/Emergency_vehicle_lighting (Accessed 21 August 2020).

9 Hickman J. *Emergency driving: BASICS practitioners and the law.* Ipswich: British Association of Immediate Care, 2015.

10 Pring DW, Young RA, Feaster H, Tang T. An audit of compliance with motor traffic regulations and use of green warning lights by consultants recalled to hospital to attend emergencies. *Emergency Medical Journal* 2007; **24:** 244-247. https://doi.org/10.1136/emj.2006.039404 PMid:17384375

11 Rural GP Association of Scotland. *What are green lights all about?* 2017. Available: http://ruralgp.com/2017/07/what-are-green-lights-all-about (Accessed 2 March 2019).

12 Rehn M, Davies G, Smith P, Lockey D. Emergency versus standard response: time efficacy of London's Air Ambulance rapid response vehicle. *Emergency Medicine Journal* 2017; **34(12):** 806-809. https://doi.org/10.1136/emermed-2017-206663 PMid:29141907

13 Medical Research Council. *Do I need NHS REC review?* 2020. Available: http://www.hra-decisiontools.org.uk/ethics (Accessed 27 September 2020).

14 Ho J, Casey B. Time saved with use of emergency warning lights and sirens during response to requests for emergency medical aid in an urban environment. *Annals of Emergency Medicine* 1998; **32(5):** 585-588. https://doi.org/10.1016/S0196-0644(98)70037-X

15 Ho J, Lindquist M. Time saved with the use of emergency warning lights and siren when responding to requests for emergency medical aid in a rural environment. *Prehospital Emergency Care* 2001; **5(2):** 159-162. https://doi.org/10.1080/10903120190940056 PMid:11339726

16 Brown LH, Whitney CL, Hunt RC, Addario M, Hogue T. Do warning lights and sirens reduce ambulance response times? *Prehospital Emergency Care* 2000; **4(1):** 70-74. https://doi.org/10.1080/10903120090941696 PMid:10634288

17 Watanabe BL, Patterson GS, Kempema JM, Magallanes O, Brown LH. Is use of warning lights and sirens associated with increased risk of ambulance crashes? A contemporary analysis using National EMIS Information System (NEMSIS) data. *Annals of Emergency Medicine* 2019; **74(1):** 101-109. https://doi.org/10.1016/j.annemergmed.2018.09.032 PMid:30648537

18 Missikpode C, Peek-Asa C, Young T, Hamann C. Does crash risk increase when emergency vehicles are driving with lights and sirens? *Accident Analysis & Prevention* 2018; **113:** 257-262. https://doi.org/10.1016/j.aap.2018.02.002 PMid:29444480