Situation awareness in young novice ambulance drivers: So much more than driving

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Abstract

The wicked problem of young novice driver road crashes, and the critical role of emergency responders in attending crashes, is well-recognised. What is less well-recognised is that emergency responders may be young novice drivers *and* young novice ambulance drivers. This project explored the situation awareness (SA) demands upon young novice ambulance drivers in Queensland through a synthesis of relevant literature, hierarchical task analysis (HTA) to explicate the complex emergency dispatch/response system, and perceptual exploration of drivers' SA. The findings reveal a plethora of opportunities for inadequate SA to negatively impact the road safety of drivers, patients, and other road users.

Background

Paramedic emergency medical service (EMS) personnel are a critical component of the Australian health system; they respond to over three million emergency calls annually and provide pre-hospital emergency care and specialised transportation (Joyce, Wainer, Archer, Wyatt, & Pitermann, 2009; Maguire, 2014). Australian EMS have a six times' higher risk of fatalities than the national worker average, with more than 85% of fatalities caused by transportation-related incidents involving paramedics driving ambulances (Maguire, 2011; Safe Work Australia, 2007), making it one of the most risky professions in Australia (Maguire, 2014).

Currently in Australia there is no strategic national approach – such as driver training and driver education for new recruits – to reduce EMS road crashes involving an ambulance (Joyce et al., 2009). Driving standards are not included in the Paramedic Professional Competency Standards which form the foundation of current education, training and practice for operational service delivery in Australia and New Zealand (Council of Ambulance Authorities, 2013). As such, driving or key skills for safe driving, such as SA (Salmon, Stanton, Walker, Jenkins, & Rafferty, 2010; Salmon, Lenne, Young, & Walker, 2014), are not normally included in undergraduate programs that are critical for preparing paramedics for practice. Recent changes to the educational pathway to become a paramedic in Australia, from an in-house post-employment model to a university based pre-employment model, has meant that new recruits are now younger (e.g., 24 years versus 27 years on average) and may be in charge of driving an ambulance while still a novice driver (Joyce et al., 2009).

Method

The relevant SA literature was synthesised and a HTA completed to elucidate the nature of the ambulance driving task to facilitate further analyses of the SA requirements during ambulance driving.

Results

The literature revealed a breadth of young novice driver, and young novice ambulance driver, SA and road-safety related concerns, including the reliance on inadequate and/or incomplete driving schemas. The HTA (see Table 1, Figure 1) revealed that the highly complex nature of emergency dispatch, response, and retrieval means that paramedic SA is quite different to 'ordinary drivers'; notwithstanding this finding, SA remains negatively impacted upon by distractions.

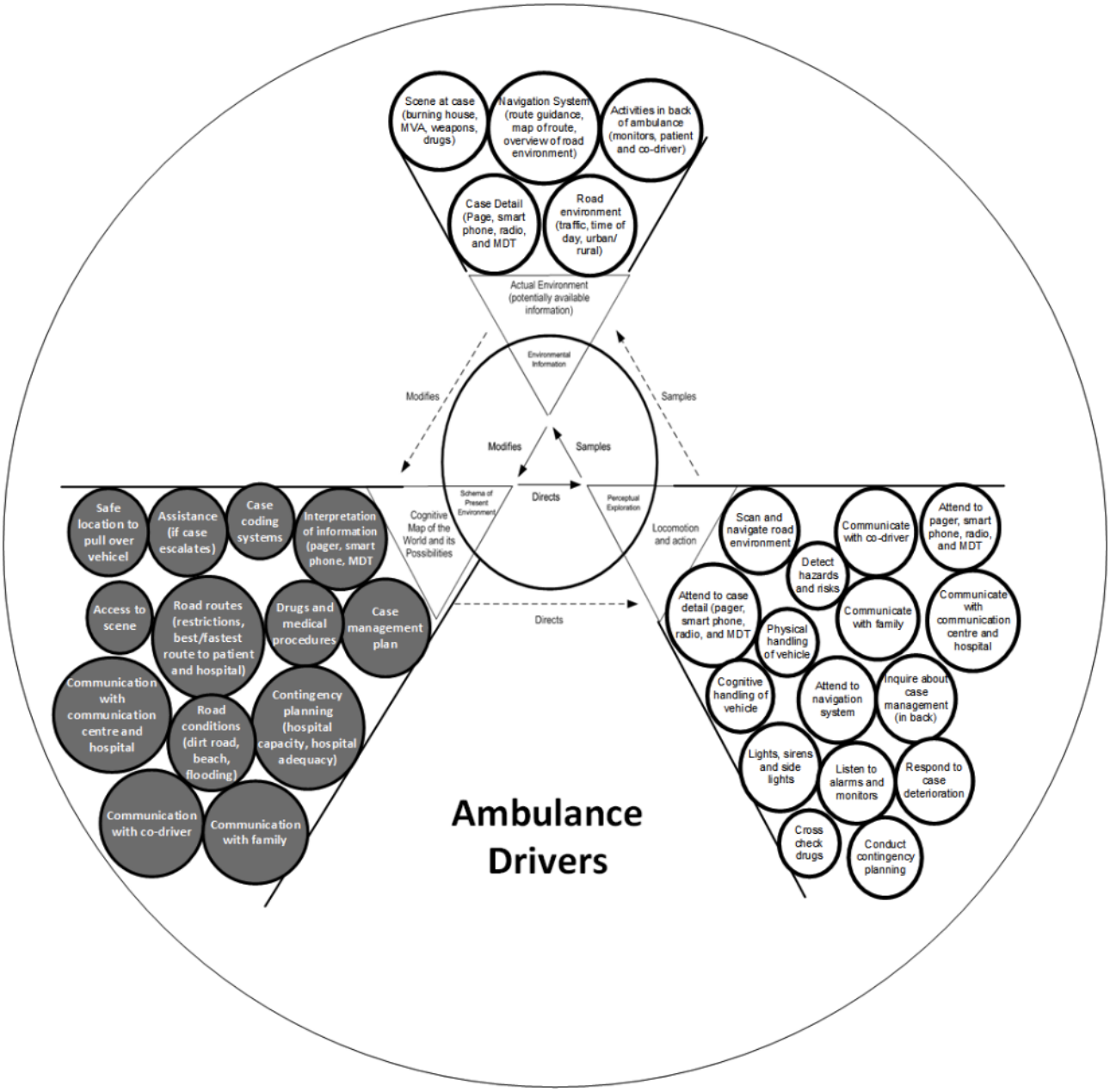

Figure 1. Perceptual exploration of ambulance drivers' situation awareness

Conclusion

Emergency responder situation awareness appears quite different to 'ordinary drivers', suggesting well-developed road-related schema are required *before* young novice ambulance drivers are behind the wheel in a highly-emotive, time-critical situation. Drivers are not simply 'driving'; they are engaged in a breadth of tasks *while* driving (e.g., accessing case details in flux) which, for safety, must rely upon adequate situation awareness skills. As such, training programs for young novice

ambulance drivers should specifically target the development and reinforcement of a breadth of SA skills to minimise on-road crash risks.

1 ***Table 1. Summary of Concepts and Themes Underpinning Situation Awareness during Ambulance Dispatch***

Super-ordinate goals	Actual environment (potential available information)	Cognitive map of the world and its possibilities (Genotype schema of present environment)	Locomotion and action (physical and cognitive action concepts – Phenotype schema of perceptual exploration)
1. Receive alert and access case details	Continuous flow of information from pager including case details, case nature, hospital capacity and case updates. Patient problem based on coding system.	Schemas around coding systems and which information from pager and smart phone upon which to focus. Schemas around contingency planning such as hospital capacity and road routes to case and hospital.	Attend to pager and/or smart phone. If already driving, navigate road environment and physical handling of vehicle.
2. Confirm case details	Continuous flow of detailed information concerning case (e.g., MVA, be aware of dog, patient with violent history, drugs, more than one victim) via MDT.	Handling of continuous flow of information from MDT (e.g., which information poses a risk or requires urgency and which information is non-urgent). Schemas around different case situations and contingency planning (e.g., best route to and from case, which hospital most suited and most likely to have capacity).	Attend to MDT and operate radio. Inquire about further information if needed. If already driving, navigate road environment and physical handling of vehicle.
3. Travel to location	Continuous update on case via MDT. Road direction from navigation system. Road environment including traffic, time of day, location and speed restrictions.	Schemas about management plan of case and drugs required. Consideration to special cases such as children and/or severe cases where more senior staff might be needed. Planning around access the scene, particularly if access is difficult (e.g., locked doors, environ-mental hazards) and/or difficult road conditions (e.g., dirt roads, flooding, off-road, the beach). Consideration for further assistance (e.g., helicopter) if case escalates.	Attend to MDT and road navigation system. Operate radio and communicate with co-driver. Calculate drug dose and management plan for case. Manual operation (physical and cognitive) of vehicle including lights, sirens and sidelights. Scan and assess road environment and attend to potential hazards.
4. Conduct hazard assessment tasks	Environment and scene at case (e.g., burning house, MVA, weapons, drugs).	Schemas around different case and environmental conditions including severity of case and/or dangerous conditions (from the environment, patient, or other people).	Windscreen assessment: 1. Identify hazards (e.g., where to park vehicle, traffic hazards, positioning vehicle to protect people or as barrier). 2. Identify type of incident (request further assistance if needed)

Super-ordinate goals	Actual environment (potential available information)	Cognitive map of the world and its possibilities (Genotype schema of present environment)	Locomotion and action (physical and cognitive action concepts – Phenotype schema of perceptual exploration)
			Update case details and scene, report information back to call centre as approach the scene. Use of mnemonics (e.g., ETHANE) where applicable.
5. Return with patient	Continuous update via MDT (e.g., hospital capacity). Road direction from navigation system. Road environment including traffic, time of day, location and speed restrictions. Activities in back of the ambulance (e.g., case management)	Schemas around hospitals including which might be at capacity (e.g., during busy times), need to bypass smaller hospital if case severe or not able to handle case (e.g., small child). Deterioration of patient and what is most appropriate management plan. Schemas around drugs and other medical procedures required on route to hospital3	Operate and attend to updates from MDT, if necessary interrogate device for more information. Attend to road navigation system. Manual operation (physical and cognitive) of vehicle including lights, sirens and sidelights. Scan and assess road environment and attend to potential hazards. Communicate with family members (e.g., update them on case, reassure them). Communicate with paramedic in the back, cross check drugs, listen to activities including alarms and monitors, query patient handling where necessary. Communicate with call centre and/or hospital staff and update them on case. Conduct contingency planning (e.g., if road is blocked and if a hospital is at capacity).
6. Deal with deterioration and/or cardiac arrest on route	Information from paramedic staff about case deterioration/cardiac arrest. Road environment including traffic, time of day, location and speed restrictions.	Schemas around case deterioration/cardiac arrest. Best and safest place to park the vehicle and most appropriate response to case deterioration/cardiac arrest.	Communicate with paramedic in the back about case, communicate with family members, call centre, and/or hospital. Identify safe location to pull vehicle over and park the vehicle. Respond to case deterioration/cardiac arrest.

Super-ordinate goals	Actual environment (potential available information)	Cognitive map of the world and its possibilities (Genotype schema of present environment)	Locomotion and action (physical and cognitive action concepts – Phenotype schema of perceptual exploration)
7. Return without patient	Continuous update on case via MDT. Road environment including traffic, time of day, location and speed restrictions.		

Note. MVA = multiple vehicle accident; MDT = mobile data terminal; ETHANE = exact location, type, hazards, access, numbers, emergency services.

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