



Charles Sturt
University

Implementation of Body Worn Cameras | Rapid Review of Current Research and Practice

Prepared for NSW Ambulance

Regional Work and Organisational Resilience Research Group
Charles Sturt University

Acknowledgements

Charles Sturt University acknowledges all First Nations elders, both past and present, from the lands where CSU students and staff reside. In particular, CSU acknowledges the Wiradjuri, Ngunawal, Gundungarra and Biripai peoples of Australia, who are the traditional custodians of the land where the University's campuses are located. CSU also acknowledges the many First Nations peoples who are the traditional custodians of the lands in which NSW Ambulance operates.

Preferred citation

Skinner, I., Wuersch, L., Bamerry L., Sutton, C., Neher, A., Hogg, R., O'Meara, P., Dwivedi, A., (2022) *Implementation of Body Worn Cameras; Rapid Review of Current Research and Practice*, prepared by the Regional Work and Organisational Resilience Research Group, Charles Sturt University, for NSW Ambulance.

ISBN Print: 9781864674262

Electronic: 9781864674279

Executive Summary

This report provides a review of recent research and literature on the implementation and use of body worn cameras (BWCs) to address the issues of occupational violence (OV) and workplace health and safety (WHS) among frontline emergency service workers in Australia, Canada, the United Kingdom, and the United States of America.

Key findings

- The extensive review of the literature and current research found that while much has been written about the rollout and implementation of BWCs in policing, there has been significantly less focus on paramedics or ambulance services.
- Research and evaluations that have been undertaken in policing or ambulance services have tended to be internal reviews, with few independent, external studies and even fewer peer-review processes.
- Studies in policing have focused on a broad range of factors, including:
 - Integrity and community trust, complaints handling
 - Use of force/violence by police officers
 - Crime levels
 - Evidence for criminal trials and streamlining procedural justice
- There has been limited focus on the impact of BWC on OV towards officers or WHS, including physical, mental, and emotional wellbeing.
- Calculations of return on investment (ROI) in previous research have included costs relating to integrity, force and violence, crime levels and evidence for criminal trials but have tended to exclude the full range of WHS elements that may contribute to employee burnout and the high turnover rates that are a significant cost to ambulance services, especially those in regional locations.
- Much of the research demonstrates that BWC can have many unintended or unexpected consequences, and evidence on the impact of BWC is inconclusive, particularly in relation to OV.
- Many studies emphasise that qualitative research may be just as illuminating as quantitative results given the challenges in determining the impact of competing variables that contribute to incidents of OV and WHS and the effectiveness of remediation strategies.
- The effectiveness of BWC in reducing incidents of OV is likely to be related to the specific circumstances of activation in any particular incident, and capturing this complexity requires a multipronged approach to data collection.
- Limitations in the evaluations of rare events related to OV need to be carefully considered.

Recommendations

Several key recommendations for implementing BWCs in ambulance services and for research and evaluation strategies emerged from the review. These include:

- BWCs alone may not be sufficient to reduce the immediate incidence of OV in the ambulance environment. Therefore, the implementation of BWCs should be supported with a range of training and development strategies and related measures designed to reduce OV.
- An independent, external, and peer-reviewed evaluation of the implementation of BWCs in an ambulance context is required. Evaluation should include a focus on:
 - How BWCs may impact OV, including the potential to escalate or de-escalate incidents
 - Workplace health and safety, including physical, mental, and emotional wellbeing
- Analysis of ROI needs to incorporate a broader understanding of the social return on investment (SROI) and the impact of BWCs on the broader community, including community perceptions of the ambulance service.
- In addressing SROI, it will be important to capture a broad range of costs and benefits, including data on OV incidence and absence from work, as well as data on the cost of equipment and storage to be able to provide a comprehensive analysis of the social and economic costs and overall benefits of BWC implementation.
- Implementation strategies must ensure ongoing compliance with regulations and integration with key operational processes and policies. For example, clear policies and procedures must be in place to ensure patient privacy, minimise increased workload and maximise the utility and effectiveness of recordings. In developing policies and procedures, consideration should be given to the impact on staff, public perception, and potential union bargaining.
- Implementation of a BWC program should be supported by adequate administrative and frontline staffing to ensure emergency service workers spend more time out in the field than undertaking administrative roles in the station.
- Staff training is a crucial element and requires careful planning and implementation. Topics may include the application of regulations and policies; effective use and handling of the BWC; when to activate the camera and when to end recording; how to deal with aggressive patients when triggered by the camera; dealing with storage and utilisation of the data; approaches if a co-worker is using the BWC or the data inappropriately or unethically. Overall, the review found that many organisations find that the videos can be an excellent training tool when used sensitively and appropriately.
- The findings of the review emphasise that for a successful implementation, it is important that the focus should be on the prevention of OV and improvement of worker wellbeing, rather than on the monitoring of officers' behaviour, performance, and policy conformance.
- Communication with external stakeholders is key for BWC implementation programs. For example, patients need to be informed of the overall program and of specific protocols for camera activation and use. However, regulation may require particular considerations (e.g., to be allowed in court if needed).
- Careful selection of the camera, including accompanying evidence management software and storage protocols, is important. Aspects such as weight, size, durability, suitability (fit for purpose), functionality, and handling (easy to use) should be considered. Cloud-based storage options outsourced from the organisations may have significant budgetary and privacy implications.

Contents

Glossary of terms and acronyms	6
1. Introduction	7
1.1 Objectives	7
1.2 Scope and inclusion	8
1.3 Setting the scene	8
2. Occupational violence and workplace health and safety.....	12
3. Hypothesised mechanisms of risk mitigation	16
4. BWC influence on work, behaviour and interaction with patients and stakeholders	17
5. Ethical issues associated with BWCs.....	18
6. Perceptions of frontline workers towards wearing BWCs	19
7. Perceptions of the community towards the use of BWCs.....	22
8. Effective strategies and models for introducing BWCs to ambulance service workers	23
9. Return on investment.....	26
10. Emergent themes for implementation of BWC in frontline emergency services	27
11. Conclusion	28
12. National and international trials using BWCs	29
13. References.....	31
14. Project team	39

Glossary of terms and acronyms

BWC:	Body Worn Camera
CCTV:	Closed Circuit Television
EEAST:	East of England Ambulance Service Trust
EMS:	Emergency Medical Service
EMAS:	East Midlands Ambulance Service
FLW:	Frontline workers
LAS:	London Ambulance Service
NEAS:	North East Ambulance Service
NHS:	National Health Service
NIAS:	Northern Ireland Ambulance Service
NSWA:	Ambulance NSW
NWAS:	North West Ambulance Service
OV:	Occupational Violence
PMVA:	Prevention and Management of Violence and Aggression
PSO:	Protective Service Officer
ROI:	Return on Investment
RWOR:	Regional Work and Organisational Resilience
SCAS:	South Central Ambulance Service
SROI:	Social Return on Investment
SWAST:	South West Ambulance Service Trust
WHS:	Workplace Health and Safety
WMAS:	West Midlands Ambulance Service
YAS:	Yorkshire Ambulance Service

1. Introduction

In 2022, the Regional Work and Organisational Resilience (RWOR) Research Group at Charles Sturt University began a comprehensive review of the NSW Ambulance (NSWA) Body Worn Camera (BWC) Implementation Project. This evaluation includes: a rapid literature review and environment scan, assessment of the impact on WHS, a ROI analysis, evaluation of the impacts on work and patients, and finally, an assessment of the impacts on staff and stakeholder wellbeing and perceptions of the BWC initiative.

A systematic review was published in 2022 that investigated the impact of BWCs on the incidence of OV towards paramedics (1). In this review, no studies were found that addressed the key research question. BWCs have been used by other frontline emergency service workers with a mixed body of literature emerging for their use by police (2–4), parking officers (5,6), transportation workers (7), and mental health nurses (8–10). A parallel line of enquiry has explored the use of closed-circuit television (CCTV) and protective service officers in the health (11–14) and retail sectors (15,16). There are fundamental differences in the rationale for using BWCs by police and paramedics, and in the environmental constraints experienced by frontline workers (FLW) in hospitals and retail settings compared to those of paramedics in the field. Therefore, the results of the studies that have investigated the effect of surveillance or protective action on OV for these various FLWs, do not inform the critical question of the effect of BWCs on OV for paramedics (17). This evaluation aims to address this gap in the literature by investigating the impact of BWCs when worn by paramedics.

This report provides the rapid literature review and environmental scan as phase one of the evaluation. The purpose of the rapid review and environmental scan is to identify and report on relevant scholarly published and grey literature, such as media and professional online sources, and investigate current evaluations of the experience and impact of BWCs on FLW in Australia and internationally. This review will inform the overall evaluation project and future BWC implementation processes by NSW.

1.1 Objectives

The objectives of this report are to identify and distil current research evidence on the impact of BWCs on FLW in relation to:

1. Change in frequency and severity of incidents of OV and WHS.
2. How BWCs may mitigate risks associated with OV and WHS.
3. How wearing a BWC influences the way in which paramedics work, behave and interact with patients, members of the public and other paramedics.
4. Ethical issues associated with paramedics wearing BWCs.
5. Perceptions of FLWs towards wearing BWCs.
6. Perceptions of the community towards the use of BWCs.
7. Effective strategies and models for introducing BWCs to FLWs that could be implemented for ambulance service workers.
8. Return on Investment (ROI).

1.2 Scope and inclusion

This review includes published and grey literature available in English with no date restriction. For published literature we have included literature reviews, experimental and quasi-experimental study designs, analytical observational studies, and descriptive observational study designs such as case studies. Grey literature includes data and reports collected and conducted for internal audits, evaluations, and media reports. Our environmental scan draws on responses to emails and short interviews with individuals from relevant frontline emergency service organisations.

We included data sources that met the following criteria:

PARTICIPANTS

Participants include any frontline emergency services or public sector organisations or personnel. Emergency services personnel include land and air ambulance services, first responders, firefighters, and any associated medical responders. Public sector personnel include local governments, and public corporations delivering services to citizens, including healthcare, law enforcement and public transportation (10). While public sector organisations such as law enforcement encompass a distinctly different setting and role to emergency responses, it was felt that integrating them in this review would ensure a comprehensive analysis. Volunteer service personnel were not excluded from the search; however, no research was found that addressed the particular use of BWCs among this group. One item mentioned volunteers as victims of assaults and abuse, without providing further data to support the claim (18).

CONCEPT

This review integrates any scenario or situation relating to the use of BWCs that could have implications for the implementation in an ambulance service. We also included data on the use of CCTV in key sectors such as health and retail. Our analysis comprises evaluations of BWC use in the field, their effectiveness at preventing or mitigating incidents of OV, the impact on FLWs' health and safety, including mental and emotional health, worker and community perceptions of their use and ethical issues relating to use, or any other issues relating to the specific objectives of this review.

CONTEXT

The search involved data from any country in any emergency service setting. However, there was a particular focus on data from Australia, the UK, the USA, and Canada as their service delivery is most similar to NSW and these regions have the most documented use of BWCs.

1.3 Setting the scene

Little is currently understood about the potential or actual impact of BWCs on the work performed by frontline emergency service workers. Specifically, there is limited research regarding the impact of BWCs on rates of OV among paramedic populations (1). Most of the literature relates to the use of BWCs by police and is focused on public safety (e.g., reducing incidences of use of excessive force by officers and police accountability).

OCCUPATIONAL VIOLENCE AND WORKPLACE HEALTH AND SAFETY

Occupational violence is defined as "when a person is abused, threatened or assaulted at the workplace or while they're working" (19). It is important to note that OV does not have to result in injury and can include intimidation, objects thrown, physical assault, property damage, road rage, sexual assault, sexual harassment, spitting and verbal abuse (20).

This report understands WHS broadly, to include workers' physical, mental and emotional wellbeing, and in particular, work-related wellbeing as "the overall quality of an employee's experience and functioning at work" (21). Research is increasingly providing evidence of the links between wellbeing and work

performance. For example, Wright and Cropanzano (22) found that psychological wellbeing was positively correlated with job performance, and therefore suggested organisations should invest in their employees' psychological wellbeing to achieve optimal performance and productivity.

OCCUPATIONAL VIOLENCE IN AMBULANCE SERVICES

The prevalence and severity of OV against healthcare workers is increasing (23,24). Previous Australian pilot data suggests that almost 90% of paramedics have been exposed to OV during their career (20). Within 12-months, it is estimated that 69% of paramedics experience at least one form of OV (25). The immediate and subsequent long-term impact on both the physical and mental health of the victim, have direct and indirect financial and personal costs to an organisation through time off work, compensation and medical management, and increased work-related psychological distress and decreased staff morale (26).

The OV against ambulance workers predominantly includes physical assaults and verbal abuse; however, as many attacks may also involve weapons, (unarmed) ambulance workers are among the most vulnerable groups of frontline staff (27). For example, in NSW, about 10 paramedics are assaulted every week, of which 50% are physical assaults. BWCs are the latest initiative to keep the workforce safe from OV and protect NSW staff (28).

Also, Queensland and overseas jurisdictions such as the UK, Ireland and the USA, report high numbers of assaults and physical attacks, including the use of weapons, trending upwards (18,29,30). On a positive note, fewer violent incidents were identified among FLWs wearing BWCs (31).

While OV is still widely under-reported by paramedics, the reporting of OV incidents against paramedics is increasing as staff become sensitised through mandatory anti-violence training and participation in wellbeing workshops (28).

EFFECTS AND COSTS OF OV

Occupational violence can have significant and long-term impacts on employees' physical and psychological wellbeing. Consequently, OV is likely to impact the ability and capacity of a medical organisation and its services. Ultimately, the effects of OV can make it challenging to get immediate medical support from frontline staff in emergency scenarios (32).

The North East Ambulance Service (NEAS) in the UK (Newcastle) published figures for costs caused by OV, including repairs and time lost to staff illness. Based on the 41 cases registered between April 2017 and October 2019, the organisation lost 411 service days due to staff illness. This resulted in a cost of £141,824 in overtime to cover missed shifts. Added to this are costs for the recruitment and training of replacements for employees who resigned, that is, between £20,000 and £30,000 per person, depending on the role and clinical skills required for the position (29).

BODY WORN CAMERAS

A BWC is a small transportable device, usually worn on the outside of clothing, glasses, or headwear to produce video and audio recordings (10). Most of the research relates to the use of BWCs by police personnel. However, the market for BWCs is growing rapidly worldwide. It is mostly law enforcement agencies and private security companies that need BWCs, but increasingly this technology is finding wider application across industries. In addition to retail, where BWCs are becoming more common, the cameras are also used in healthcare, public transport and a range of other public service functions (33). Depending on the technology, BWCs can be integrated into existing CCTV systems. Activating the BWC can generate a notification to the video management software, allowing security personnel or others to intervene and take action if necessary (16).

The use of BWCs increased significantly in the mid-2000s after a series of high-profile deaths of citizens in the USA as a result of police force. It is estimated that by 2016 about half of the 15,328 general law enforcement agencies in the USA had adopted the use of BWCs (34). The suggestion is that if a paramedic who is equipped with a BWC turns on their camera in a potential OV situation, they may be able to de-escalate the situation and reduce their susceptibility to OV (35). For a paramedic, there may be factors that

reduce the effectiveness of BWCs on minimising OV. For example, paramedics often attend to patients who are under considerable physical or psychological distress and may not be in conscious control of their actions. In these situations, patients may lack awareness of being recorded or be unable to change their behaviour in response to the advice of camera activation.

The purpose of using a BWC varies between different frontline services. In policing, a primary focus is to improve police integrity and build community trust through greater transparency in complaints handling and the reduced use of force or violence by officers. Claims have also been made in policing that BWCs may reduce crime levels and criminal justice costs by providing evidence for criminal justice. Within paramedicine, the key purposes can be summarised as:

- Minimising OV and improving workplace safety
- Providing evidence of critical incidents
- Assessing the quality of services

For ambulance services, a high priority is to keep FLWs, volunteers, and communities safe and protected from violent incidents. Greater transparency for staff and citizens may contribute to de-escalating difficult situations and improving community relations (36).

A BWC can also collect evidence against individuals who show antisocial and abusive behaviour. Footage captures individuals who are threatening or physically assaulting paramedics and will be given to the police for prosecution (28). Consequently, the legitimacy and accountability of both law enforcement and civilians can be improved. BWCs may accelerate the handling of incidents, insurance matters and complaints. Evidence may also help reduce complaints against officers and resolve complaints against Emergency Medical Service (EMS) practitioners. On the other hand, footage can capture unethical conduct and failure to follow protocols or clinical practice guidelines. Video documentation could possibly be used to inform policy initiatives, assist in creating an early warning system, for example, to inform law enforcement, and allow for historical analysis and review at a later stage (37,38).

A BWC can further be used for quality assurance and live oversight, and as an educational tool. BWCs may be utilised to identify training requirements, evaluate clinical practice and improve work practices. For example, visual documentation can offer effective scenario-based training opportunities, assist in quality improvements, increase the productivity of the service, and promote EMS practitioner accountability to increase patients' safety (36,39).

FRONTLINE SERVICE WORKERS

For this report, we have reviewed the effects and impacts of BWCs on FLW that may influence the use of BWCs among paramedics. The broad collection of settings and personnel we have included can be categorised as frontline workers from various service industries, and refers to:

- Emergency healthcare workers – paramedics, first aiders
- Emergency services – fire, search and rescue
- Armed and tactile forces
- Law enforcement – police officers, sheriffs' departments
- Security personnel
- Other public sector personnel delivering services to the public – train guards
- Medical professionals – nurses, doctors
- Retail workers.

MEDIA REPORTING ON BODY WORN CAMERAS

Despite many high-profile media reports noting the implementation or trials of BWCs to prevent OV and keep paramedics safe, there has been little systematic evidence presented in the media to support their claims. It is not yet known if wearing a body worn camera decreases the incidence of OV (1,40). Furthermore, it is unclear if there are other unknown effects or unintended consequences of wearing BWCs for paramedics.

WHAT IS MISSING

Before NSW begins its implementation and evaluation, a broad sweeping review of published and grey literature will ensure that the program and evaluation are underpinned by a sound understanding of the challenges and ethical issues surrounding the use of BWCs and maximise the potential for successfully measuring the impact of BWCs on OV.

2. Occupational violence and workplace health and safety

PARAMEDICS

Despite the multiple media reports advocating for the use of BWCs and describing initiatives in the UK, USA and Australia, we did not find any studies that evaluated the effect of BWCs on rates of OV or WHS when worn by paramedics. Two systematic reviews also determined there were no studies that addressed the effect of BWCs on OV for paramedics (1,10).

A single study investigated the use of BWC within medical simulations and role-play to assess the impact of BWCs on documentation during and after paramedic call outs (42). The study identified that documentation practices could be significantly improved by reviewing recorded events. However, the study did not explore any issues relating to the effect of BWCs on OV.

In one media report, the NEAS in the UK noted an unexpected increase in incidents of OV during their BWC trial; however, this was addressed through a statement explaining that the coverage of BWCs was insufficient to have made a difference to the number of assaults reported (43).

OTHER FRONTLINE SERVICE WORKERS

There are mixed results concerning the use of BWCs by other frontline service workers (2,3,44). Most of the literature about police personnel focuses on the USA, where BWCs are primarily used to reduce the incidence of excessive police force (2). However, in Sweden and Spain, BWCs have been used by police personnel to minimise harm to police officers (44). We have not yet been able to locate or review any peer-reviewed or grey literature on the outcomes of these BWC trials in Sweden and Spain in relation to OV.

A randomised control trial investigated the use of BWCs by transport service staff working at train stations with high rates of reported assaults in the UK (45). The results indicated that there was a 47% reduction in the odds of assaults against staff who were wearing a BWC compared to staff who were not wearing a BWC at a control location. The authors concluded that in this situation, BWCs could reduce at least 3,000 working days per year lost due to physical assault at work (45). It has been highlighted that workplaces and environments with high rates of assault have more to gain from interventions such as BWCs, and as such, these results likely highlight a best case scenario of the potential gains from BWCs to prevent workplace violence (46).

While much of the literature on BWCs in the context of police forces has examined the effects on police behaviour, there is reported data on the effect of BWCs, when worn by police, on civilian behaviour. Specifically, studies report the effect of BWCs on OV towards police from members of the public. In contrast to the findings of Ariel (45), the combined results from 10 randomised control trials from eight police forces investigating the use of BWCs by police personnel involving the evaluation of 2.2 million police officer hours, found that assaults against officers were higher when cameras were worn (45). These results may seem counterintuitive at first, but there are potential explanations for this unexpected result. It is worth noting at this stage that any generalisations from data relating to the effect of cameras worn by police to reduce OV need to be treated with caution given the difference in the nature of the interactions between police personnel and the public, compared to those of paramedics. A closer inspection of the results reveals some important points to temper the conclusions from this article. In particular, the results at the various locations were quite different. In fact, a study of visual data on OV levels suggests that in one particular location, there was a clear increase in OV during the BWC trial. It is unclear what was different about this site; however, its results may have skewed the overall result of the study. Hence, the outcome of this study highlights the potential limitations of drawing causal conclusions from studies that are not designed to demonstrate cause and effect. Indeed, demonstrating cause and effect of a BWC to change rates of OV is fraught with danger. This is most clearly demonstrated by the considerable body of literature

investigating the effect of BWCs on police personnel with mixed results across multiple outcome measures (46).

Further evidence as to the mixed results of the effect of BWCs to change rates of OV in police is demonstrated in a systematic review investigating the use of BWCs by police. The authors identified 15 studies that reported an outcome related to officer injuries. They note that despite the outcome measure being reported in 15 studies there is a lack of evidence supporting the beneficial or harmful effects of BWCs on officer injuries due to the large confidence intervals and high heterogeneity within the included studies (47). As with Ariel (45), the inconsistencies between multiple studies highlight the challenges of using quantitative methods to determine effectiveness given the inability to control many of the confounding variables.

An interesting perspective is offered on the mixed results of the effect of BWCs on rates of OV in policing. It has been suggested by Lum and colleagues (48) that because of the BWC being turned on, police alter their behaviour in a way that inhibits their ability to avoid assault. The argument is that police use less force for fear of repercussions while a camera is recording. This presents a potentially paradoxical effect where police are using less force but this increases their exposure to rates of OV (2,49). While paramedics are less likely to use force or violence to subdue a patient than police, the potential implication is that turning on a BWC may have unintended and unexpected consequences for paramedic and patient behaviour.

USE OF BODY WORN CAMERAS IN MENTAL HEALTH SETTINGS

While there are lessons that can be learned from the use of BWCs in police forces, there are limitations to the generalisability of the research due to the fundamental difference in the roles between police personnel and paramedics and their interactions with members of the public. Arguably the research that has been undertaken on the use of BWCs in mental health settings provides a more useful context when looking at the effect on rates of OV. The rationale for the use of BWCs in mental health settings is similar to that for paramedics – to record situations where conflict may occur and facilitate the use of containment measures to improve staff safety and patient care (10).

Two studies conducted in the UK have investigated the use of BWCs in mental health wards (8,9). A pilot study by Ellis and colleagues (8) involved the use of 50 BWCs worn by nurses in seven mental health wards. The results indicated that the overall number of incidents did not change due to the introduction of BWCs. However, there was a reduction in the number of the most serious incidents. Conversely, there was an increase in the least serious incidents. The results varied by ward, indicating heterogeneity in the results, thereby limiting the generalisability of the results. No qualitative data was collected as part of this study and the reasons for the changes noted were not discussed. The authors did note that data relating to nurse activation of the cameras was not collected and could therefore not be analysed as a confounding variable. Given the small sample of participants in this pilot study, it would not have been appropriate to release data that could potentially identify participants.

A feasibility study by Hardy et al. (9) involved the use of 12 BWCs in five psychiatric inpatient wards worn by nursing staff and the Prevention and Management of Violence and Aggression (PMVA) team over three months. The BWCs were worn by a member of the nursing staff on each of the five wards, a member of the PMVA team and the night manager. For the study it was agreed that when staff were called to an incident, all staff wearing a camera would record the incident. Staff were trained to narrate the scene and talk to the camera to provide context about what they saw and intended to do. Staff were allowed to turn off the camera if they believed it was exacerbating the situation and could turn the camera around if they felt it was appropriate to record the sound but not the visuals. Staff were instructed to explain to patients that the camera was being worn for the safety of staff. Training for staff took 90 minutes. The results from this study were mixed with only a small number of incidents reported (verbal abuse, violence, supportive hold, emergency restraint), making comparisons pre and post introduction of the BWCs limited. Taken together, these two small studies indicate that it is possible to use BWCs in medical settings, but multiple factors contribute to the effect of BWC use on rates of OV and the implementation can have very specific effects on the outcomes.

Overall, the message and lessons from the available literature on the effect of BWCs on OV in frontline service workers is mixed. The lack of published or publicly available data on the effect of BWCs on OV when worn by paramedics is clear justification for evaluating the implementation by NSW. What is also clear from available data on the frontline service workers is that large samples and multiple sites are important to account for the variations and statistical noise found in smaller evaluations. Reasons for changes in behaviour by users or members of the public also need to be clearly investigated and not assumed based on the data. The rates of OV will inform what has changed, but why rates change is clearly just as important given the mixed results from other evaluations on the effect of BWCs on OV for frontline service workers. This highlights the importance of using a mixed methods approach and collecting both qualitative and quantitative data as part of the evaluation of effectiveness.

CCTV AND BWC IN THE RETAIL SECTOR

CCTV has long been used in the retail sector to address various issues including 'loss prevention', customer service complaints and OV of workers (15,50). The abuse of retail workers has been an ongoing issue, even before the COVID-19 pandemic (51,52). Examples have included customers under the influence of alcohol and aggression associated with credit card payments being declined. Overall, an increase in a culture of customer complaints encouraged by the media or emboldened by social media, has been observed (51). Since the pandemic, retail workers have been considered essential FLWs with the added responsibilities of reviewing vaccination certificates, enforcing social distancing and ensuring facemask compliance. Consequently, threats and aggression towards employees across the industry increased during the pandemic. Therefore, selected retail staff in six major department stores (e.g., Target Australia) across Australia are now wearing BWC to reduce abusive customer behaviour (53).

According to a retail industry report, there were more than 150,000 abuse incidents against retail staff in the UK in 2019, which equates to 455 incidents a day (33). This number has almost tripled continuously in 2020 and 2021. Examples include when retail workers are required to implement age-restricted sales controls. Videos have been shown to help retail outlets respond quickly to incidents and provide support to staff (52). Retailers can use BWC technology to deter abuse and, in the event of abuse, provide evidence for possible prosecution. Data protection must be guaranteed. Furthermore, BWCs are used by retailers to better protect employees, customers and the wider community and help them feel safer (33).

PARKING STAFF

Verbal abuse, assault, threatening behaviour, dangerous driving and violence are increasingly problematic for parking staff. Hundreds of parking staff are attacked or verbally abused by angry motorists every year (54). OV is a particular issue for parking staff in hospitals as they are responsible for ensuring access to parking spaces for patients and keeping evacuation routes clear (55). For example, in the Western General, St. John's and Royal Edinburgh hospital car parks, verbal and physical abuse by angry drivers erupted to the stage that official uniforms and BWCs were introduced in a trial to deter aggression, enhance public safety and make the service more efficient (55). Indeed, it has been argued that people generally respect individuals in official uniforms (55) and are less likely to become violent when aware that they are being filmed (6). As a result, parking officers with BWCs have been found to feel safer (6). Furthermore, in the case of OV incidents, footage may be used in any resulting court cases. To maintain privacy for customers and staff, however, there needs to be clear policies on BWCs, such as parking staff must wear a label saying they are wearing a BWC (5).

OCCUPATIONAL VIOLENCE IN HOSPITALS

Occupational violence against doctors and nurses in public hospitals in Australia has become a politically sensitive issue (56). Most recently, in Victoria, the Liberal Opposition have made an election promise to address the safety of staff in hospitals by placing protective service officers (PSO) in hospitals experiencing high levels of OV incidents (57). However, a previous parliamentary inquiry (58) found that "hospital staff in general and security personnel have unanimously opposed the placement of armed PSOs in hospitals". The

report of the inquiry suggested that there was much broader support for a range of mechanisms to help prevent antisocial behaviour and, consequently make hospitals a safer place for staff, patients, and visitors. In particular, the inquiry found that “strategies to prevent and address violence in hospitals are most effective when clinical staff, security staff, management and external workers such as paramedics and police work collaboratively as part of a team” (p. vii) and that strategies to prevent and address violence in hospitals should be underpinned by a ‘patient focused’ approach that draws on interpersonal skills to defuse, minimise and manage aggressive behaviour. The recommended strategies included:

- Comprehensive education and training programs to address violent behaviour in hospitals for both clinical and security staff, and public awareness programs for patients, their families and visitors.
- Approaches that recognise the specific factors that contribute to hospital violence, such as clinical causes, alcohol and other drug use and mental illness, and promote strategies to address these.
- Environmental and design strategies that address the situational factors that may exacerbate violence in the hospital setting, particularly emergency departments.

These sound principles should underpin the development of any strategies to address OV and WHS among frontline emergency service workers and have particular implications for those working in the community.

3. Hypothesised mechanisms of risk mitigation

Some articles (30,43) have shown that a BWC can moderate work-related risks for FLWs. Such risks include encountering aggressive, violent and antisocial behaviour, and assaults by patients or other people involved in emergencies. Hence, frontline staff need to be protected from violence and abuse in the workplace. The rationale for BWC used by UK ambulance staff is to prevent and deter crimes (NEAS; London Ambulance Service (LAS)) or to prevent from violence and support prosecutions (Northern Ireland Ambulance Service (NIAS)). In Australia, the most significant reason for BWC implementation identified by ambulance services is to determine the effect of BWC use on incidents of OV (NSWA, AV).

Significant claims have been made in the media (59,60) that the use of BWCs can contribute to preventing assaults, de-escalating aggressive situations, and thus protecting staff, patients, and the public. For example, activating the camera and advising people involved in the incident that they are being recorded may contribute to prevention and de-escalation of such incidents. Similarly, recordings of aggressive or abusive behaviour can provide evidence, such as in court, and therefore protect frontline staff. That is, recordings can provide greater transparency and accountability for ambulance staff and citizens by allowing the precise reconstruction of events; such footage can serve as an 'independent witness' (30).

The mechanisms by which a BWC can mitigate risks for frontline emergency service workers are not well documented and publicly available data to support the theory that BWC mitigate risk is limited. Given the significant funding being invested in UK pilot studies and the expansion to a national rollout, it is likely that internal evaluation data provides evidence of their effectiveness; however, no such reports could be located through the search process. Success has been reported in the media as an improved perception of safety by ambulance staff. Some media reports suggest that BWCs help de-escalate potentially volatile situations. These reports frequently identify the need to implement BWCs due to the rising incidence of OV. Although subsequent stories report the success of pilot studies, generally such media reports do not include data that provides an indication of OV figures since the implementation of BWCs. Given the significant funding being invested in pilot studies and the expansion to a national rollout, it may be that this information is contained within internal evaluation data; however, it is not possible to verify given the lack of publicly available data.

One argument that has been identified in a peer-reviewed journal article, is that as BWCs are perceived as a form of safety net (44), they can actually contribute to higher rates of reported incidents. Hansen et al. argue that BWC use actually decreases officers' safety because it is a distraction that causes additional stress (49,61,62). Qualitative studies have shown that officers in serious and dangerous situations find it difficult to maintain the mental focus required to turn on the camera (63,64). BWC use is not prioritised in such situations because they "unfold very quickly and officer safety is critical" (63).

4. BWC influence on work, behaviour and interaction with patients and stakeholders

There is surprisingly limited evidence in the peer-reviewed literature about the impact of a BWC on the labour processes, work patterns or professional practices of paramedics. Even among policing articles, only one recent study by Hansen et al. (44) explores the issue. They found that a dominant control rationale that encourages rapid BWC implementation comes at the expense of officers' work environment, health and safety considerations.

Recent public reports highlight positive and challenging ways in which BWCs affect some aspects work of FLWs. On the one hand, it is claimed that BWCs provide greater confidence in risky situations and more safety through supporting video evidence (65), and might be considered a useful training tool as the recordings are particularly helpful for high-risk and low-frequency types of engagements (66). Owens has argued that footage can be used to share good practice, change culture around the perceptions of BWCs, and professional development officers also gave examples during interviews of using BWC recordings to achieve the early resolution of potential complaints with little grounds, preventing them from becoming formally progressed (66).

On the other hand, BWCs create additional paperwork, maintenance and some discomfort when attached to the uniform. Furthermore, relying on BWC footage as an accurate presentation of an event may lead to negative or unintended outcomes. For example, recordings may neglect visual distortions, provide a limited view, and can be mental and physiological stressors. Workers' perceptions of scenes may appear quite different when viewing BWC video. Lenses show imagery that may not be visible to the human eye so things may be evident in the video playback that would not have been evident to the person on scene. Also, the footage is viewed without context so conclusions may be drawn when watching the video without the broader perspective of other factors not captured but processed automatically by the responder on scene (audio, visual, olfactory clues). The viewer may also miss events that are out of sight as the camera only points one way and events happening 'off camera' will not be visible during playback (67). These factors can affect perception, understanding, and decision-making (68).

Overall, a BWC may influence the behaviour of patients and other stakeholders involved in emergencies and their interactions with FLWs as video security can discourage abusive and threatening behaviour and contributes to improving the safety and confidence of frontline staff.

5. Ethical issues associated with BWCs

Reviewing the grey literature has shown that several ethical issues need to be considered. Privacy issues for FLWs and citizens (e.g., recording in use in the patient compartment) are of major concern and came out in several publications. In this context, FLWs' safety, public access, and re-victimisation were also mentioned.

Most ethical issues, however, directly relate to policy requirements; that is, appropriate policies need to be in place to ethically and effectively use BWCs. Grey literature highlights the following areas where policies are needed:

- The circumstances when the BWC can or must be switched on/off need to be clear. For example, what is the general rule to start and end the recording; (when) can people or patients ask for the camera to be switched off?; what discretion do FLWs have to activate/deactivate the BWC? (69).
- Similarly, consent may be required. In contrast to law enforcement units, there seems to be a lack of consensus in the healthcare community on how recording technology should be used most effectively. For example, going a step further than just recording, it needs to be clear whether a patient can be refused to be transported based on the use of pre-hospital live-streaming technology (70).
- BWCs are used to reduce assaults which may require collaboration between ambulance services and the police. However, how can ambulance and police services liaise without breaching privacy regulations? (43).
- Another major area to be clarified is data security. Over time, a huge amount of secure storage is needed and restricted and confidential accessibility (e.g., to prohibit improper release or transmission) must be ensured. That is, a policy is needed governing the use, storage and protection of the recordings (69). Also, circumstances that allow the recordings to be copied and the process for their legitimate release (e.g., to be used in court as evidence) must be regulated. Lastly, rules need to be in place about when the data will be systematically deleted.
- Transparency was another ethical issue that was mentioned. The BWC must be visible, and people need to know when the BWC is recording provided it is practical; for example, in a large crowd, it is not feasible to make everyone aware the BWC is switched on (71). This raises the question of how much (context) information needs to be provided when using the BWC.

From the grey literature, it emerges that clarification is needed about when an issue is part of policy and when it is part of governmental regulations.

In conclusion, BWCs appear to be a useful and supportive tool for ambulance services and patients; however, it needs to be remembered that because technology makes something possible, it does not automatically mean that it is *always* the right thing to use. In other words, “[a]ll it would take is for one video of a patient care encounter to find its way into social media or one lawsuit holding that the patient was not properly notified or did not properly give consent, and the whole premise of recording calls for positive purposes, such as training, quality assurance, or telemedicine, will be lost” (70).

6. Perceptions of frontline workers towards wearing BWCs

Frontline workers' perceptions of BWCs have been identified as one of the key success factors in implementing BWC programs (72). Understanding these perceptions can be crucial for overcoming resistance (73), creating buy-in (61) and improving outcomes (74). Predictably, there has been minimal research into the perceptions of paramedics towards BWC to date (1), although Dewar et al. (75–78) found positive attitudes in a convenience sample of 83 paramedics who were part of the Resuscitation Rapid Response Unit (3RU) and had been trialling BWCs.

There have been more extensive studies exploring attitudes and perceptions among police officers in the USA and UK. One of the most used theoretical approaches in these studies is the Technological Acceptance Model (TAM), which identifies that acceptance of technology will be linked to its perceived usefulness and ease of use (75–78). Bartholomew et al. (75) extend this model to explore how aspects of leadership and organisational culture contribute to the acceptance of new technology. Using this approach, studies have distinguished between concepts of receptivity and acceptance, have explored differences in attitude by rank, and how attitudes and perceptions change over time and depending on whether adoption of technology is voluntary or mandatory (79).

Receptivity is identified by Bartholomew et al. (75) as different from acceptance, with receptivity measured before participants know whether they will ever be assigned a BWC. In contrast, acceptance is measured over the longer term once they have begun using BWCs. In pre- and post-implementation surveys, the team found that receptivity to using a BWC was significantly determined by three attitudinal factors:

- The perceived likelihood of positive changes in community member behaviour
- The perceived likelihood of improved officer safety from wearing a BWC
- The perceived value of camera footage for evidentiary purposes

Pelfrey and Keener (63) highlight that in pre-implementation surveys, officers also had concerns relating to a 'Big Brother' approach to surveillance, including using camera footage for performance evaluations and internal investigations. However, this factor did not influence participants' receptivity to BWCs. Similarly, Bartholomew and colleagues found in their post-implementation survey that concerns about surveillance were not realised and so negative perceptions reduced over time.

Pelfrey and Keener's study also explored whether the perceptions of frontline officers and their supervisors towards BWCs changed over time. They found that while officers and command staff were optimistic about the benefits of BWCs before implementation, post-implementation officers were less convinced that cameras impacted community behaviour but were generally positive about their impact on safety and evidence, while command staff remained positive about BWCs across all factors.

Koen et al. (80) also explored how perceptions change over time:

Our findings (much like Lin & Cornford, 2000 and Koen & Willis, 2019) imply that perceptions of BWCs do not remain consistent over time and with increased interaction. As evidenced by users' framing of the technology strategy, change occurred but it also ebbed and flowed between positive and negative views. A "flashpoint" (i.e., the needle event) significantly changed their experiences with BWCs and played a major role in abruptly changing the trajectory of their frames. This supports the notion that police perceptions of BWCs are not static but can be changed.

Not all post-implementation findings have been as positive as those of Pelfrey and Keenan, with Straight (81) finding that although officers' acceptance of technology improved, particularly through familiarity and

improved ease of use, perceptions of the usefulness of BWCs did not improve, with some officers suggesting that BWCs had limited impact on changing their own behaviour and community behaviour.

Pre-implementation perceptions of BWCs were not uniformly positive among police officers across locations. Gaub (61) and colleagues compared officer perceptions across three locations in southwest America – Phoenix and Tempe in Arizona and Spokane in Washington. They found that Phoenix officers had negative perceptions of BWCs, Tempe officers had largely positive perceptions, and Spokane officers' perceptions generally lay somewhere in between. This trend continued post-deployment. Each department's officers reported improved perceptions of the ease of use and comfort of BWCs, but they became more sceptical about the impact on citizens. Tempe and Spokane officers, overall, increasingly recognised the positive effects of BWCs, whereas Phoenix did not see this trend. This variability of responses is supported by Willis (73), who argues that the culture of a police service has a significant impact on receptivity and acceptance of technology:

Within police organizations, the traditional police culture, often described as resistant to reform, can be a powerful factor for shaping efforts to change police practices. This includes the acceptance and use of new technologies. The police culture may not be as monolithic as contemporary reformers claim, and early police ethnographers observed, but its key dimensions continue to distinguish policing as an organization and occupation.

Workplace culture has been found to have a significant impact on perceptions of BWCs, and two studies have particularly focused on organisational justice as potentially contributing to workers' perceptions. Organisational justice has three components, distributive justice (equitable access to resources and funding), procedural justice (internal processes of decision-making) and interactional justice (fair interpersonal relationship between individuals) (82,83).

While Kyle and White (82) found that officer perceptions of organisational justice are a significant factor in officers' attitudes towards BWCs, Lawshe and colleagues found no observable relationship between organisational justice and officer attitudes. This may be because Kyle and White examined six indicators of officer attitudes, while Lawshe and colleagues focused only on perceptions of officer safety and community complaints (83).

Huff and colleagues (79) explored a single aspect of organisational justice – whether adopting BWCs was voluntary or mandatory during implementation. Overall, the research found that there were relatively similar perceptions between volunteers, and that compared to officers in the control group, who did not wear BWCs:

Those who wore BWCs—mandated or voluntarily—did not view them as having an impact on citizen reactions (e.g., making a complaint) and behavior (e.g., less aggression) and were less likely to recommend them to other agencies and fellow officers after their implementation.

While technology, systems, and governance are important aspects for the use of BWCs, the human perspective, such as the perception of frontline staff towards wearing BWCs is crucial as well for a successful application. Media and professional online sources show that these perceptions do vary. For example, in a survey of Victoria Police, over 90% of the respondents held 'very positive' or 'positive' attitudes toward using BWCs in family violence matters (84).

Other positive perceptions highlight (43,85):

- BWCs can help to de-escalate situations when patients, service users, relatives, and members of the public become aggressive.
- BWCs can prevent assaults and thus protect frontline staff and communities, including from false complaints and accusations.

- BWCs provide a feeling of safety and support to FLWs, contributing to mental health and wellbeing in the workplace.
- BWCs deliver recordings of what is effectively happening, generating a piece of evidence (if needed later, for example, in court and for tougher sentences for criminals).
- BWCs may make the jobs of FLWs and volunteers easier.

In contrast, grey literature also emphasises some negative perceptions of FLWs towards wearing BWCs. Concerns are particularly raised about patients' privacy and confidentiality due to the sensitive nature of the work that paramedics do (69). Further negative perceptions emerged based on the lack of trust in supervisors (and/or management) leading to concerns that BWCs could be used against staff in some way. On a meta-level, BWC recordings are seen as reactive rather than proactive; that is, BWC footage more commonly captures the aftermath and reporting of an event rather than the incident itself (86). Also, while BWCs may initially be perceived as intrusive, a study has shown that most frontline staff saw BWCs as a positive step for the service after using them (87).

From a more technical perspective, it is suggested that the BWC as a tool should be carefully selected to contribute to a positive perception. For example, aspects such as the weight, size, durability, suitability and positioning, functionality, and handling (easy to use), and the accompanying evidence management software should be closely considered (88) in the selection process.

7. Perceptions of the community towards the use of BWCs

Community attitudes and perceptions towards paramedics wearing BWCs have received limited focus in peer-reviewed works. There has been more focus on community perceptions of BWCs in policing in the USA, where there has been recent public outcry against the use of police force among vulnerable community members (73,75,89). As a result, the focus of this research has been primarily directed to issues of integrity and excessive use of force by police (63). However, Bromberg et al. emphasise the importance of determining the level of citizen support for a specific BWC program and caution against relying on 'public opinion polls' as a gauge of true citizen support for BWCs (89).

Crow and colleagues (90) found that "there is a lack of prior research on community members' perceptions of BWCs, and there is no theoretical framework directly applicable to explaining those perceptions" (p. 596). They drew on prior research and theory regarding procedural justice, perceptions of police performance, and fear and concern about crime to explore how local communities in two Florida counties responded to the implementation of BWCs. Overall, the findings indicate that positive perceptions of police performance and more police interaction were associated with greater perceived benefits of BWCs, whereas privacy concerns reduced perceived BWC benefits. Respondents' views of procedural fairness and crime concern were indirectly related to perceptions of BWC benefits. Non-White and younger respondents were indirectly less likely to perceive benefits. Given the high levels of trust and respect for paramedics in Australia (91), these community perceptions may have less direct relevance for NSW; however, they illustrate the important links between trust and integrity and the implementation of BWCs in the field.

The non-academic literature indicates that the community generally perceives the use of BWCs as positive. Video footage supports a more accurate and complete reporting and documentation of assaults and thus contributes to building trust and confidence, which is crucial in the service. BWC videos also capture the ambulance staff's point of view and thus contrast with bystander recordings of EMS in the home, on the street and even in the patient care compartment (92). Citizens are normally less likely to complain when BWCs are in use and visible (93). However, they have privacy expectations, that is, 'location matters'. Specifically, in public locations, such as roadways, parking lots, sidewalks, in a store or the hallway of a facility, there is little expectation of privacy. In contrast, in more private locations, such as patients' homes, in a private room at a facility where a patient sleeps or even in a restroom, patients may have a greater expectation of privacy (39). Therefore, considered engagement of the BWC is important and regulations and policies must be strictly followed. Citizens may also be concerned about potential breaches of privacy and the use of BWCs for unintended purposes, such as prosecuting illegal activities (86).

In general, there is very little information available on processes for preparing ambulance staff and community stakeholders for the implementation of BWCs. The exception is in the case of the Northern Ireland Ambulance Service (NIAS), which had two rounds of community consultation reporting favourable attitudes from the community towards using BWCs by ambulance staff. The results of the public consultation, along with the survey questions used are publicly available. In surveying citizens about their attitudes towards BWCs, Bromberg et al. (89) note that perceptions of social desirability may impact results as participants respond to social and media expectations. This suggests the need to incorporate qualitative data into the data collection processes when studying stakeholder perceptions.

8. Effective strategies and models for introducing BWCs to ambulance service workers

While there is limited evidence and public information on the use of BWCs for paramedics, there is a growing body of literature on the use and implementation of BWCs in other FLWs. The following is incidental information that was discovered during the review process that may be helpful when considering the implementation and evaluation of BWCs for NSWA.

POLICY FOR BODY WORN CAMERAS

Sound, clear and interconnected policies are needed for effective implementation.

A review of BWC policies by Canadian police forces provides useful considerations for elements that should be included for BWC policies for frontline emergency workers (94). Key themes often contained in policies included articulating expectations relating to:

- The BWC program itself
- BWC users
- BWC supervisors
- Data management and retention
- Video disclosure

Within the expectations for BWC policy, aspects have been identified that are often included:

- Deactivation
- Notification
- Consent
- Alternative recording options
- Video uploading and cataloguing
- Video viewing

Appendix B of the article by Saulneir et al. (94) provides helpful examples of policy regarding the themes that may be worth reviewing against the policy being developed by NSWA.

POLICY AND GUIDELINES REGARDING THE WEARING OF BWCS

Policy should state the requirements for when BWCs should be worn. For example, policy should indicate when one frontline staff member should wear a BWC if another colleague in the ambulance does not. Such situations may cause confusion and produce an incomplete record of an incident (92).

NOTIFICATION AND ACTIVATION

A common theme regarding policies for BWCs concerns notification and activation of the camera. There are mixed perspectives as to when a camera should be worn and the guidelines for when the recording should be switched on. Furthermore, tactics for introducing BWCs were mentioned (60), such as cameras should always be worn and, if possible, the recording should be switched on. BWCs should be user-activated, that is, assigned to the FLW using their ID badge.

Wilson et al. (10), in their systematic review, noted that there was mixed evidence for the policy and guidelines surrounding notifying others about the activation of cameras. They noted:

The practice of camera wearers verbally announcing recording varied and a range of visual warnings to alert others varied from audible sounds, flashing lights and activation of screens. Camera activation was either at staff discretion or mandatory for the duration of a shift.

Critical aspects that emerged are appropriate training, operational guidance, and creating an environment that allows frontline staff to spend more time out than back in the station (administering cameras) (88). Consequently, staff feel more at ease using the cameras in the field and resistance may be reduced.

OTHER POTENTIAL ADVANTAGES

The footage obtained from BWC has been used to share good practice and change culture around the perceptions of BWCs and provide opportunities to aid professional development (66).

IMPROVING DOCUMENTATION

A small pilot study investigated the effect of BWCs on improving documentation by paramedics (34). The study was conducted in a simulation lab so has limited generalisability from the perspective of authenticity for clinical practice, but it is one of the only studies that has investigated the use of BWCs by paramedics. Participants (experienced paramedics) attended a simulated scenario with actors behaving in a standardised manner (e.g., 95). The BWC was a camera attached to the side of a pair of glasses to accurately reflect what the participants were viewing. Multiple factors had to be considered simultaneously when participants documented the scenario based on their recollection of the event. Participants were then allowed to view the recording of the BWC and make any changes to their documentation as a result of viewing the recording. Of the 10 participants who took part in the study there were 71 documentation changes to correct inaccurate or missing information after watching the recording, including 51 moderate and 13 major changes. The results of the study indicated that wearing, recording and reviewing BWC footage has the potential to increase the accuracy of documentation for paramedics (34).

BWC AS A SOLO INTERVENTION

Studies have identified that BWCs are one intervention for a complex problem and that while people being filmed is a potential strong motivator for behaviour change, it should not be used in isolation and needs to be accompanied by other interventions to reduce OV. It is noted that in police settings, BWCs may curb some of the worst police behaviours. Translated to a paramedic situation, BWCs may be able to alter the behaviour of cognisant potential offenders acting with a clear mind; however, this still needs to be determined (96).

OUTCOME MEASURES

In the context in which there was appropriate evidence to justify reviews of the literature, such as the effect of BWCs in policing settings, inconsistent definitions and use of terminology were noted as being a limitation in comparing studies. For example, the use of force in studies of policing is different between studies, making pooling of the results difficult. The implication for paramedics is that OV needs to be carefully defined to set a standard of what it is for future comparisons with other studies (46,97). The selection of outcome measures is important with reference to using rare events to determine effectiveness. It has been noted that when an outcome measure is rare, relative to the total number of recording hours, then it is harder to demonstrate a causal effect and account or control for confounding variables (98).

DELAY IN OUTCOMES

Evidence from the use of BWCs in police forces indicates that it may take considerable time to observe changes in OV given the lag in reportable outcome measures. There is also a delay between the introduction of an intervention such as a BWC and reported changes in user behaviour. In addition, stations

that begin from a low point in terms of high rates of OV have the most room for improvement and are potentially more likely to demonstrate positive changes (98).

OTHER PRACTICAL CONSIDERATIONS

Batteries – The battery management in the station needs to be strictly organised including allocating responsibilities to ensure that there are always sets of batteries ready to be used for the duration of the full shift. For this, batteries that last beyond the shift are required (i.e., up to 12 hours of recording).

Communication – Communication from management is essential to ensure a successful rollout and it would be beneficial to provide a forum to allow staff concerns to be addressed. BWC Champions at station level, in addition to project leads, may also be beneficial and have been effective in other services implementing new initiatives.

OTHER HELPFUL RESOURCES

In May 2015, the Bureau of Justice Assistance (BJA) released a National Body Worn Camera Toolkit designed to provide BWC resources ranging from research to guidance on policy, training, and stakeholder engagement. The Toolkit includes a Law Enforcement Implementation Checklist:

<https://bja.ojp.gov/program/bwc>.

9. Return on investment

Return on Investment is a financial metric that can be used to evaluate costs and benefits of workplace interventions. ROI is the ratio of the net benefits of an intervention compared to its total costs. Moving beyond simple economic costs, social return on investment (SROI) attempts to capture the social impact of policy interventions as well as the economic impact. This evaluation will use the SROI methodology to assess the financial impact and the potential savings arising from the introduction of BWCs.

SROI is defined as “a framework for measuring and accounting for the much broader concept of value. It seeks to reduce inequality and environmental degradation and improve wellbeing by incorporating social, environmental and economic costs and benefits” (99). Hence, SROI is a process for understanding, measuring, and reporting the social, economic and environmental value created by an intervention, program, policy or organisation (100). SROI can be used retrospectively to measure outcomes that have already occurred (evaluative-type) or prospectively to predict how much value will be generated if the intervention meets its intended outcomes (forecast-type) (99). Data collection and subsequent analyses allow the calculation of a benefits-to-costs ratio (99). For example, a ratio of 4:1 indicates that an investment of \$1 delivers \$4 of social value.

Few studies examined in this review provided details of costings or savings associated with implementing BWCs. One exception was Braga and colleagues’ study of the Las Vegas Metropolitan Police Department (31), which explored the impact of BWCs on police practice and provided a cost/benefit analysis based on the incidence of misconduct, use of force, and the increased revenue from fines and arrests. In a randomised control test approach, they found that officers with a BWC had fewer complaints of misconduct, fewer violent incidents, and higher rates of arrest, resulting in higher levels of fines, which contributed to net savings of between \$2,909 and \$3,178 per user per year. Overall, there was limited evidence of calculation processes for ROI of the implementation of BWCs released in public reports or peer-reviewed literature.

While these costs and incomes are less relevant for ambulance services, it will be important to capture a broad range of costs and benefits, including data on OV incidence and absence from work, as well as data on the cost of equipment and storage costs to provide a true analysis of the social and economic costs and overall benefits of BWC implementation.

10. Emergent themes for implementation of BWC in frontline emergency services

In addition to the previously mentioned concerns, there are some open questions and limitations that are worth mentioning. From a legal perspective, it is argued that BWC footage may lead to better and fairer legal outcomes. However, following a review of the non-academic literature, it is unclear what legal framework exists for BWCs to be used, what legal reforms are required (if any) to allow courts access to video footage during civil proceedings, and who has access to the videotapes.

Further questions to be addressed are, for example, whether the heat and radiation of a BWC can become an issue for patients and FLWs and whether an agency may be held liable in cases where the footage demonstrates poor patient care (76).

From a technical point of view, shortcomings of the BWC should be considered. For example, BWCs cannot capture the effect that stress, and high levels of adrenaline can have on officer perceptions, and the variations between camera quality footage and imagery seen by the human eye (67,101). In other words, BWCs cannot accurately capture the experience and stress levels of the officer involved in a critical incident, which may result in a false narrative of the officer's experiences – this is one of their greatest limitations. Also, there is limited contextual information due to the BWC only being turned on when a situation escalates; the events leading up to the episode of interest are often missed (86). Moreover, poor audio quality and limited view when the BWC is obscured can limit the use of BWC footage in court proceedings.

Maintenance of the cameras and battery management are critical to ensure BWCs are ready to be engaged at any time. It can be assumed that these tasks and responsibilities do not have to be completed by frontline staff as they should spend their precious time out in the field rather than back in the station.

11. Conclusion

The literature highlights the advantages of BWCs, such as increased safety for frontline staff and other stakeholders involved in emergencies, and the use of video footage as evidence in court. Success reported in the media includes perceptions of safety by ambulance staff and BWCs helping to de-escalate potentially volatile situations. Media reports generally refer to the need for BWCs due to the rising incidence of OV. Although the identified media stories report the success of pilot studies, no data is reported that indicates OV figures since the implementation of BWCs. There is significant funding invested in BWC pilot studies being expanded to a national rollout. Evaluation data may already exist; it may be retained by the organisations as internal data and not made publicly available, thus cannot be verified or subject to peer-review processes. Staff training is needed for a successful implementation of BWCs; for example, the correct application of privacy policies; effective handling of the BWCs; and safe data storage. In turn, video footage can be an excellent training tool to assess and improve the quality of the services. For the implementation to succeed, a level of trust must be developed between employees and their managers and BWCs must not be used for punitive purposes such as performance evaluation or monitoring FLWs in their daily practice.

Hence, concerns emerged over privacy issues regarding insufficient policies clarifying the use of BWCs and recorded footage, fear of frontline staff being monitored, and the costs involved in technology, data storage, and training. To strictly comply with the regulations, operational processes must be adapted (filling in forms; data transfer; name tagging) and FLW should be supported by administrative staff so they can spend more time in the field than in the office. Furthermore, the rapid review showed that previous calculations of the ROI included only some of the WHS elements. Employee burnout and high turnover rates lead to significant costs for emergency services, therefore future evaluations should include a broader understanding of the SROI and impact of BWCs on the wider community. To provide a genuine cost-benefit analysis, it is necessary to include the social impacts of BWCs; data on the occurrence of OV and absenteeism at work; and data on the costs of equipment and storage. Such a comprehensive SROI analysis can reveal social and economic costs and overall benefits of BWC implementation. The review also showed the importance of communication with the various stakeholders. There needs to be internal communication with staff and external communication with patients who need to be informed when the camera is activated. Trade union negotiations and the involvement of the community are also important preconditions for broad acceptance.

Evidence suggests that BWCs may provide a range of benefits within the policing environment; however, organisations may find themselves in a dilemma about whether or not to introduce BWCs, particularly based on privacy concerns. For example, while Queensland Police has committed to the most ambitious full-force rollout of BWCs, Queensland Ambulance refuses to use BWCs (29). Overall, the review showed a range of research and reporting on BWCs in the police arena and less so in the paramedic or ambulance service. Evidence of the impact of BWCs on OV and WHS remains limited. Research on BWCs in police or rescue services is contained in predominately internal documents and not independent, external studies that have been subject to a peer review process. There is strong evidence that qualitative results are as important as quantitative measures due to the complex nature of the research field with many competing variables. Therefore, an independent, external and peer-reviewed assessment of the implementation of BWCs in the ambulance context is required. Such an assessment should focus on the impact of BWCs on OV, including WHS and physical, mental, and emotional wellbeing, ethical considerations and perceptions of FLW and key stakeholders. The evaluation should also provide a comprehensive measure of SROI.

12. National and international trials using BWCs

Location	Date	Organisation	Participants	Aim	Findings	Comments
Northern Ireland, IE	2022	NIAS	Ambulance staff	To deter violence and support prosecutions	Project only launched in May.	Launched following pilot in Belfast and public consultation.
UK	2021	All 10 Ambulance Service Trusts NEAS, YAS, NWAS, WMAS, EMAS, SWAST, SCAS, EEAST, LAS	Ambulance staff across 10 NHS Ambulance Trusts	To prevent and detect crimes committed against ambulance staff	3-year project – first year of data collection underway. Monthly reporting. No publicly available results.	Pilot trial conducted at LAS & NEAS. Staff reported feeling safer and that BWCs helped de-escalate hostile situations. NEAS originally trialled in 2018. Some concern from staff that camera footage will be used against them.
London, UK	2021	LAS	Ambulance staff	To prevent and detect crimes committed against ambulance staff	Staff reported feeling safer and that BWCs helped de-escalate hostile situations. No publicly available results.	Pilot led to nationwide rollout as detailed above.
North East, UK	2021	NEAS	Ambulance staff	To prevent and detect crimes committed against ambulance staff	Staff reported feeling safer and that BWCs helped de-escalate hostile situations. No publicly available results.	Pilot led to nationwide rollout as detailed above.

Belfast, Northern Ireland, UK	2021	NIAS	Ambulance staff at Bridge End Belfast	To deter violence and support prosecutions	No publicly available results.	Pilot led to extended rollout.
Australia	2019	NSWA	Paramedics at 3 pilot sites: Sydney Ambulance Centre in Eveleigh, Liverpool Superstation and Hamilton station	To evaluate the effects of BWCs on OV	No publicly available results.	12-month pilot. 60 cameras used across all three sites in the pilot. Incidence and severity of violence rising.
Australia	2016 / 2017	VA	Paramedics in 'high-risk locations including Melbourne CBD'	To protect paramedics and reduce violence To be used to support prosecutions	No publicly available results. Union representative from NSW said the AV pilot showed no discernible reduction in violence although supporting data has not been published. https://www.miragenews.com/australian-paramedics-association-does-not-support-nsw-ambulance-body-camera-trial/z	Project funded by the Health Service Violence Prevention Fund (\$500,000). Almost 10% of the 5,000 cases attended in 2015/2016 were reported as involving OV.

13. References

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14. Project team

	<p>Associate Professor Larissa Bamberly has extensive experience in researching organisations, labour markets and gender relations in regional Australia. She has undertaken a range of qualitative and quantitative research projects for government and industry. Of particular relevance to this project, she has recently prepared a report on skill shortages in agriculture in the Riverina and undertaken a range of qualitative interviews with young people in regional and metropolitan locations, exploring their experiences of education, training, employment and unemployment.</p>
	<p>Dr Ian Skinner is a Senior Lecturer in the School of Allied Health, Exercise & Sports Sciences. He researches the mechanisms and management of pain and the efficacy of patient centred approaches to help manage people with debilitating chronic conditions. He has presented nationally and internationally as an invited speaker on the nature of pain and evidence-based interventions for pain management in clinical practice. He has experience using a variety of research techniques.</p>
	<p>Dr Lucia Wuersch specialises in communication and relationship management and organisational training design and development. She has experience working on a range of communication and community building projects, including the digital transformation of remote work settings; health professionals' fall-reduction training using virtual reality; and community resilience building through a pollinator garden in regional Australia. Lucia focuses on qualitative research methodologies.</p>
	<p>Dr Alain Neher is an Associate Head of the School of Business and a Senior Lecturer at Charles Sturt University. Before joining academia, he worked for more than 25 years in industry, including senior management and leadership roles in private, public, and not-for-profit organisations, as well as in armed forces logistics focusing on training and support services. His research interests are in, but not limited to, business ethics, organisational culture and values, performance management, workforce wellbeing, and ESG (Environmental, Social, Governance).</p>
	<p>Clare Sutton is a Senior Lecturer in Paramedicine at Charles Sturt University. Her research interests relate to resilience and promoting health and wellbeing in emergency service workers, student paramedics and volunteer responders. She has extensive experience in the emergency services sector and has held several leadership positions, including program lead of paramedicine at CSU and Chair of the Paramedic Wellbeing Group for the Australasian College of Paramedicine (ACP).</p>

	<p>Dr Rachel Hogg is a Lecturer in Psychology, with significant research experience in industrial-organisational psychology, social psychology, and workplace wellbeing. Rachel has researched the impact of workplace injuries, mental health in the workplace, and has teaching expertise in stress, trauma, and coping. Rachel conducts both qualitative and quantitative research and has significant experience collecting and analysing research data.</p>
	<p>Dr Abhishek Dwivedi is a Senior Lecturer in Marketing in the School of Business, Charles Sturt University. He researches brand strategy, customer-brand relationships, and social entrepreneurship. He has published in the European Journal of Marketing, the Journal of Business Research, the Journal of Brand Management, the Journal of Marketing Theory and Practice, and the International Journal of Advertising.</p>
	<p>Professor Peter O'Meara is an Adjunct Professor in the Monash University Department of Paramedicine, a Board Member of the Paramedic Network, and the Director of the Global Paramedic Higher Education Council. Peter is an internationally recognised expert on paramedicine models. He is a registered paramedic, with qualifications in health administration, public policy, and agricultural health and medicine.</p>
	<p>Dr Alfred Wong is a Senior Lecturer in the School of Business. His expertise is in statistical analysis, including large and meta-data sets, financial management, and applied economics. His research interests are in the areas of empirical finance and applied healthcare economics. He has won several teaching and research awards, published in international peer-reviewed academic journals and successfully completed several industry research grants. Alfred is a member of the Global Association of Risk Professionals, USA.</p>