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Developing a welfare module for the Australian forensic-register

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ABSTRACT

Forensic investigators face a disproportionately high risk of post-traumatic stress disorder (PTSD), with one in six developing the condition – triple the rate of the general population. While current case management systems track operational details, they fail to capture psychological load. This paper presents the evidence-based development of a 'Welfare Module' for the Australian National Forensic-Register to address this gap. Through semi-structured interviews with 26 Queensland Police Service (QPS) personnel, we identified specific Risk Markers that intensify traumatic impact, including Human Resonance (vulnerable victims, visible grief, personalization) and Sensory Shock (disgust, surprise). These are compounded by Contextual Stressors, such as cumulative exposure and workplace constraints. The study also highlighted Barriers to Coping, specifically organizational stigma and the reluctance to self-report due to career concerns. The proposed module integrates risk features (e.g. victim demographics, decomposition level) into the existing forensic-register architecture. By employing algorithms to track individual exposure metrics and predict cumulative load, the module bypasses self-reporting barriers, enabling more informed deployment and timely, proportionate interventions.

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Forensic investigation; occupational trauma; post-traumatic stress; case management systems; workplace mental health

One in six forensic investigators will develop post-traumatic stress disorder[1] – triple the rate of the general population[2]. This alarming disparity reflects exposure load: civilians average 3.2 traumatic events over the course of their lives[3], whereas forensic investigators can attend the same number in a single working day[4]. Deceased children, burnt human remains, grieving families, post-mortem examinations – day after day, year after year[5–10]. Most trauma research focuses on recovery. Less is known about proactive monitoring and management of traumatic exposure to reduce its impact on high-stress occupations[11,12].

A practical challenge is that proactive welfare management often relies on self-report, yet officers may be reluctant to disclose distress due to stigma and perceived career risk[13]. In contrast, officers are typically willing to describe operational features of a scene and the constraints of their work. Capturing exposure indicators within routine workflow therefore offers a complementary, system-level pathway to support early, proportionate interventions without requiring stigmatized self-disclosure.

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Current forensic case management systems log the operational details of each scene – who attended, what evidence was collected, which analyses were performed – but they capture nothing about psychological load. No algorithm tracks how many infant deaths an officer processed this quarter, whether they attended a decomposed body yesterday, or whether the victim's face resembled their own child's. As a result, supervisors may have limited visibility over cumulative exposure, recent high-intensity work, or the contextual constraints that shape recovery. This paper addresses that gap by translating practitioner knowledge into a proposed Welfare Module that can be embedded within routine forensic case logging.

The forensic-register, developed by bdna, is Australia's predominant forensic case management system and part of the bdna public safety platform. The forensic-register is used by forensic services across Australia by state and federal police and government agencies. The application replaces multiple disparate systems with a single integrated forensic case and laboratory information management system that covers all forensic disciplines in addition to personnel and laboratory management. Over two decades of refinement have produced a system that integrates with broader organization record management systems and includes crime scene, fingerprint, and analytical workflows, exhibit management, and laboratory information management into a single end-to-end platform – enabling real-time data sharing across agencies and supporting ISO/IEC 17,025 accreditation requirements. The forensic-register's existing architecture for logging scene attendance, recording notes, evidence handling, and personnel management provides an ideal foundation for the 'Welfare Module' proposed here. Rather than building a standalone welfare system, the module leverages data the forensic-register already captures (officer attendance, scene type, case characteristics) and extends it with minimal additional input fields to generate psychological load metrics alongside operational ones.

Aims and scope

This paper has two aims: (1) to identify, from QPS personnel perspectives, the scene-level risk markers and contextual stressors that intensify traumatic impact, and the organizational barriers that inhibit coping and help-seeking; and (2) to translate these qualitative findings into evidence-based, functional specifications and design recommendations for a software module that can monitor traumatic exposure and facilitate timely support. Here, 'evidence-based' refers to a transparent mapping from systematically analysed practitioner accounts to specific data fields, metrics, and workflow triggers.

Method

Interview design

To determine the functional specifications for the Welfare Module, we conducted semi-structured interviews with serving Queensland Police Service (QPS) personnel. The goal was to identify specific 'risk markers' that are currently untracked in standard logging and to identify barriers to coping that the module would need to circumvent. Investigating resilience from a practitioner's perspective requires approaching the problem from multiple angles. Direct enquiries often yield superficial or socially

desirable responses, especially in organizations with strong cultures of stoicism[13]. Therefore, we employed cognitive task analysis techniques[14,15] to uncover the tacit knowledge and hidden cognitive processes that underlie forensic resilience. Our methodological approach incorporated multiple angles of inquiry – asking participants to describe not only their own experiences with trauma and coping but also their observations of colleagues, their bodily sensations during difficult scenes, the qualities of resilient peers, and the subtle signs of both resilience and distress they recognize in the field.

Ethics and organizational approval

Ethical clearance was granted by The University of Queensland Human Research Ethics Committee (HREC # 2023/HE001013). Access to QPS personnel was authorized by the QPS Research Committee following internal review. All participants received an information sheet, provided written consent, and were reminded of their right to withdraw without penalty. Interview recordings and transcripts were de-identified and stored on an encrypted, password-protected drive.

Participants

The sample comprised 26 QPS personnel – 14 men and 12 women – who had served an average of 24.3 years ($SD = 8.0$, range = 9.5–40) and spent 6.9 years on average in their current positions ($SD = 4.7$). Their present appointments covered seven broad categories: Scenes-of-Crime, forensic coordination or management, forensic imaging, specialist support units such as Dog- and Railway-Squads, scientific-officer duties, general-duties first response, and an administrative crime-management role. Historically, many had served in other jurisdictions and had rotated through additional positions – e.g. general-duties constable, detective (Criminal Investigation Branch/Child Protection Investigation Unit), covert surveillance, fingerprint examination, forensic crash investigation, and child-protection interviewing – illustrating the breadth of operational experience represented in the study. Though a sample of 26 drawn from a single jurisdiction necessarily limits generalizability, the depth of experience in this sample and the consistency of themes across diverse forensic roles provide a robust empirical foundation for the module's conceptualization.

Data collection

Between December 2023 and March 2024, the first author conducted one-to-one, semi-structured interviews in quiet workplace meeting rooms. Each session lasted ~60 minutes (range 45–90). Interviews were audio-recorded and live-transcribed with *Otter.ai*; transcripts were cleaned against recordings and de-identified. The interview guide consisted of 35 questions across five domains: (1) personal/career background, (2) training experiences, (3) nature of traumatic exposure, (4) cognitive and emotional responses to trauma, and (5) coping strategies and resilience perceptions.

Analysis

Transcripts were imported into NVivo 14. Analysis followed Braun and Clarke's[16] six-phase reflexive thematic analysis procedure: familiarization with transcripts, initial inductive coding, code consolidation, theme development, theme review, and reporting with illustrative verbatim extracts. To enhance analytical rigour, the first author's codes were cross-checked against codes generated by a large language model (ChatGPT-4.5; OpenAI) using fully de-identified transcripts. The human and AI codebooks were merged, with the first author reviewing every consolidated code and discarding or relabelling where necessary. This AI-assisted yet human-led workflow follows emerging guidance on LLM augmentation of qualitative coding[17–20].

Results

Analysis uncovered 'Risk Markers' – elements that make scenes particularly distressing for attending officers, and 'Barriers to Coping' – obstacles that prevent officers from accessing support or maintaining resilience. We conceptualized a "Welfare Module" to record scenes' Risk Markers while bypassing officers' Barriers to Coping.

Risk markers

Human resonance

Certain incidents carry heavy emotional impact because of their profoundly human elements – particularly vulnerable victims, visible grief, and victim personalization.

Vulnerable victims. Many participants identified vulnerable victims as being especially traumatic: *'A more innocent victim, if that makes sense. Even though that's not the right term, if you had someone who hasn't contributed to the scenario, that has a larger effect'* (Participant 5). Cases involving children were frequently described as the most upsetting scenes. One Scenes of Crime Officer with 24 years of service stated, *'Child deaths are always confronting . . . the baby deaths were the hardest'* (Participant 08).

Moral Foundations Theory identifies care against harm as an evolved instinct that generalizes from protecting one's own child to *any* helpless target[21]. These incidents activated both empathic concern and protective anger, as predicted by the Care/Harm module's function of safeguarding dependents[22]. For example, Participant 25 stated, *'We've come out of a job like that before and we stood on the footpath, we all had a cry and hugged each other because it was just so sad to see the loss for that family'*, whereas Participant 19 offered, *'Someone had killed a dog with a rock, like bashed him in the head . . . and then thrown the dog in the river. I don't like hearing about that stuff anymore. I find that I get angry'* (Participant 19). Note, however, that the increase in distress associated with vulnerable victims emerged even when their death was not the result of interpersonal violence. Participant 20 recalled photographing the autopsy of a pregnant woman: *'We do a lot of postmortems . . . That one, I'll be honest, was confronting'*.

Because distinct distress arises from victim vulnerability, generic case logs are insufficient for tracking trauma load. Consequently, one recommendation for the forensic-register is the inclusion of a mandatory 'Victim Demographics' field (see Figure 1). This

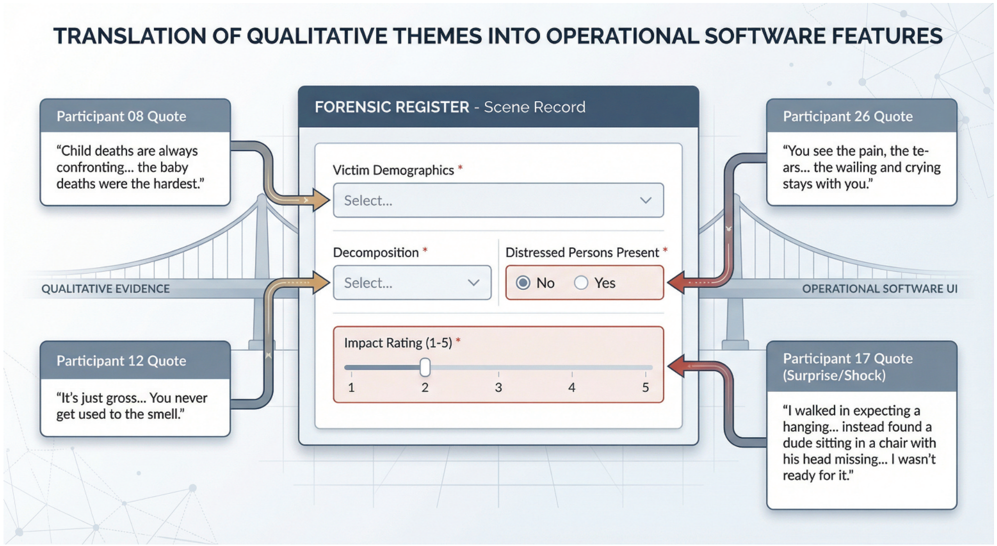

Figure 1. Translation of qualitative themes into operational software features.

would allow the algorithm to weight a scene involving an infant differently than a scene involving an adult male, reflecting the 'Care/Harm' moral foundation identified in the interviews.

Visible grief. Beyond vulnerable victims, having to witness raw grief also intensified impact. Most ($n = 23$) participants noted finding scenes more emotional when the victim's family was in attendance: *'... your heart breaks for them'* (Participant 25). A Senior Officer described an interaction with grieving parents:

> But when you're trying to pry the two-week-old, Sudden Infant Death Syndrome child out of the parents' hands because we have to check that child's body for trauma underneath their clothing, but they don't want to release their child—that's where the difficulty is because you see the pain, the tears, and that's that's [sic] real life, you know. You're looking at their trauma, the tragedy that's unfolded for them, their worst day of their life. (Participant 26)

Participant 20 expressed *'feeling (the) grief'* of a mother who attended her 17-year-old son's body after he *'hung himself from a basketball net down the road from where he lived'*. The participant's eyes welled as she recalled the way the mother stroked the face of the deceased and what she said to him in their final moment together. Many participants described the sound of *'the wailing, and crying, and the screaming'* (Participant 8) of grieving families as one that 'stays with you' – aligning with neuroimaging evidence that neural responses to others' social-emotional suffering persist longer than responses to others' physical pain[23]. To monitor Compassion Fatigue[24] – a type of burnout that results from witnessing raw grief – the module should include a binary 'Distressed Persons Present' field, allowing the algorithm to track cumulative grief exposure alongside cumulative death exposure.

Victim personalization. *'For me, it's anything that relates to my family . . . my biggest fear is losing those that I love'* (Participant 20). Many ($n = 22$) participants discussed 'victim personalisation' – that is, relating the victim to one's own life – as the most ubiquitous traumatic impact intensifier. A victim might share a physical resemblance (Participants 8, 10, 18), a medical condition (Participants 8, 10), an age (Participants 8, 10, 20), or a relationship dynamic (e.g. a parent officer attending a child victim; Participants 16, 17, 20) with an officer or their loved one, triggering empathic cognitions: *'You go, That could have happened to my family member or . . . to me'* (Participant 21). A Scenes of Crime Officer with 24 years of service detailed the difficulty of attending an autopsy of a seven-year-old boy who matched her own son in age, hair and eye colour, and medical condition (which happened to be the victim's cause of death; Participant 8). The participant echoed others' assertions that the difficulty eased once the victim's face was removed (a standard element of autopsy examinations) because personalization was no longer involuntary.

Though it is not feasible to predict or record every possible instance of victim personalization, some demographic filtering is possible. The 'Welfare Module' should allow officers to voluntarily add basic information to their forensic-register profile (hidden to other users), such as their parental status as well as the ages and any special needs of their children. When a case involving a potential relatability clash arises, the system should prioritize deployment on non-matched staff.

Sensory shock

In addition to the emotional context, participants noted that certain sensory aspects of scenes make them more traumatic. In particular, scenes that elicited feelings of disgust or surprise were reported as more impactful.

Disgust. Some participants reported extreme gore or disfigurement to amplify the traumatic impact of a scene. Participant 9 graphically detailed a fatal train accident that required physical arrangement of dismembered remains. More common was concern regarding bodily fluids or decomposition: *'When we go to a scene with a decomposed body, general duties police will often ask me, "How you get used to the smell?", and I say to them, "You never get used to it"'* (Participant 12). Participants 15 and 19 can still vividly recall the sight of deceased victims with mouths full of maggots and bodies covered in fly eggs. Participant 13 discussed the difficulty of ascending a staircase without contaminating evidence by vomiting or trudging through the bodily fluids that leaked from the deceased's body. Participant 26 described wearing deteriorated skin like a glove to recover fingerprints for identification.

Multisensory exposure (sight, odour, physical touch) acts as a multiplier for traumatic impact. To operationalize this, the proposed interface would include specific queries for 'Decomposition' (None to Advanced) and 'Injury Extent'. This distinguishes between a 'clean' sudden death and a highly decomposed recovery, allowing the system to flag the latter for higher psychological risk points.

Surprise. Many ($n = 16$) participants reported increased traumatic impact from scenes that involved the element of surprise. Surprise often results from unknowable and unexpected elements. Participant 23 recalled an unexpected finding during the post-mortem of a woman who was murdered in a love triangle: *'The pathologist has pulled out*

a fetus, which was – she didn't appear to be pregnant or anything like that. Then all of a sudden, these legs come out . . . and then there was a postmortem conducted on the fetus'. Other times, surprise was the result of poor briefings that contained incorrect or incomplete information:

> The job said it was a hanging, so I walked in expecting a body hanging or a body laying [sic] on the ground with a rope attached. And in fact, he had blown his head off with a shotgun. So, I walked into a dark shed with my torch trying to find a body hanging and instead found a dude sitting in a chair with his head missing and I had been walking through his brain matter. And I remember being completely thrown off by that because I was expecting one thing and got something completely different. And I went outside very quickly . . . I had brains on my shoes. So that was a bit more confronting because I wasn't ready for it. (Participant 17)

Surprise sometimes emerged through feelings of uncertainty. Not knowing how to proceed or which steps to take can leave officers vulnerable to traumatic impact: *'Once you get overwhelmed by "What do I do?", if you're not the person that can find your way out of "What do I do? I don't know where to start", then the rest becomes very affecting'* (Participant 3). This finding is consistent with uncontrollability and unpredictability models of PTSD[25] and is echoed by other high-stress practitioners such as surgeons[26], medical physicians[27], and military and civilian emergency medical personnel[28].

Whether surprise emerged from unknowable unexpected elements, poor briefings, or situational uncertainty, its effects were almost always amplified by novelty; all 26 participants found initial or early career exposure to be the most impactful. Participants described habituating to exposure such that they can barely remember recent scenes but still vividly recall early ones: *'Once you've gone to your first deceased who's been burned to death, the second . . . I don't necessarily remember, because it's another burned to death'* (Participant 26). A Scenes of Crime Officer with 33 years of service recalled the first deceased body he attended in his career: *'I walked into a morgue, and I saw a person with a soup ladle getting blood out of a chest cavity. And that was very confronting for me . . . I wasn't really ready for that . . . I was 19 years old . . . I think if I'd been shown photos and described the process and why [certain actions are taken], I would have been more prepared'* (Participant 6). Participants uniformly reported a lack of formal preparation for traumatic exposure. Participant 8 described her first year of service as a *'baptism of fire'*. Other participants seemed to suggest that there are fundamental limitations to how effectively training can prepare officers for the realities they face: *'I don't think anything can prepare you adequately to do what we do'* (Participant 12). These findings regarding early career exposure suggest a need for gradual exposure protocols during training – a recommendation beyond the scope of the current module but warranting future development.

Contextual stressors

Cumulative exposure. *'Every day. Because when we're not at the scene, we're reviewing case files from other people'* (Participant 2). The interviews revealed a paradoxical pattern: as officers gained experience, they became desensitized and less impacted by traumatic scenes, yet the sheer volume of exposure could build up and eventually overwhelm. Several participants described a 'bucket' that slowly fills over years of exposure until 'one bad job' tips it over. For one Forensic Coordinator, the death of a four-year-old (as a result of being left in a hot bus) was the breaking point that triggered a psychological collapse

after four decades of service: *'I didn't think I could manage to go back to work. I was broken I suppose'* (Participant 24). This finding is consistent with Cumulative-Career Traumatic Stress [the 'bucket' theory of police trauma; 29], which predicts non-linear failure: once the bucket is near full, an otherwise routine scene can push an officer past their coping capacity.

To monitor cumulative exposure, the 'Welfare Module' should calculate each officer's *recovery period* (number of days since last death scene), *exposure frequency* (number of death scenes attended or reviewed in rolling time windows), and *time on scene* (hours spent exposed to material on and off each scene). To optimize officer deployment, case allocation logic should prioritize officers with the lowest and most distant *exposure metrics*, the lowest *cumulative intensity score* in a rolling window, and no recent clusters of similar *scene characteristics*.

Workplace constraints. *'The main stressors in the organisation are the organisation'* (Participant 14). Many ($n = 18$) participants cited workplace constraints such as long shifts void of designated breaks, low staffing, and late callouts as traumatic impact intensifiers – a well-established concern of emergency service responders[29]. Participant 20 recalled a scene that required her to be awake for *'37–38 hours straight'*. Participant 3 recalled having to attend a particularly traumatic scene when her reserves were already low, and telling her forensic coordinator, *'The second you say to me, "This person can come", and I know that they can perform my function, I'm out' . . . There wasn't anybody because we just had such skim staffing levels"*. Chronic understaffing may mean supervisors rarely have the luxury of choosing who to deploy. But even then, tracking exposure serves two purposes: it gives supervisors hard data to advocate for more resources, and it ensures that on the occasions when they do have a choice, that choice is informed rather than arbitrary.

Personal life stressors. Participant 26 gave a compelling analogy that officers might manage the regular influx of traumatic scenes as long as each new incident is the only challenge at that time; but if, for example, they are also going through a divorce, then an otherwise manageable scene can cause a *'house of cards'* collapse. This finding is consistent with Conservation of Resources[30] and Job Demand Resources[31] frameworks and echoes quantitative evidence that family stress predicts psychological distress in emergency service personnel[32]. We cannot require officers to disclose the challenges of their personal lives – nor should we. But the voluntary profile could include a simple 'reduced capacity' toggle that lets someone signal 'I am not at my best right now', without having to explain why.

Other participants suggested that certain life events might permanently alter an officer's resilience. Becoming a parent was frequently cited as transformative to how officers processed scene material. *'It certainly got much harder after I had a kid. Before that . . . you can disconnect more. But once you have kids, I think you become very aware of your own mortality'* (Participant 17).

These 'Risk Factors' rarely operated in isolation but instead compounded when multiple factors converged. Impact intensified when *human resonance* (vulnerable victims, visible grief, personalization) collided with *sensory shock* (disgust, surprise) and was amplified by *contextual stressors* (cumulative exposure, workplace constraints, personal life pressures). For example, attending an infanticide in the

presence of grieving parents after a 14-hour shift might produce the highest load. For this reason, the module should include a global 'Scene Impact Rating' as well as scene characteristic inputs. This combination could be used in a machine learning algorithm to determine, generally and for individual officers, which elements or combinations of elements pose the greatest risk of traumatization. A high scene impact rating that is not accompanied by known-risk characteristics (i.e. a routine scene) might suggest the presence of unmeasurable elements such as surprise or victim personalization. In such a circumstance, additional support should be offered to the attending officer.

Tracking risk markers addresses half the problem. But if officers struggle with asking for help – which our interviews suggest they do – then the system must intervene first. The following barriers shaped our approach to automating support triggers that do not rely on self-disclosure.

Barriers to coping

Participants faced several systemic barriers that hindered their ability to access support or maintain resilience effectively. These obstacles operated at organizational, interpersonal, and individual levels, creating additional stressors that could compound the traumatic impact of their work. Three primary barriers emerged from the data: organizational stigma, perceived inefficacy (of resources), and protecting others (from tertiary trauma).

Organizational stigma

A pervasive barrier identified was the lingering stigma around admitting distress or seeking help. Many participants noted that in police culture, there has historically been an expectation to *'suck it up buttercup'* and not show weakness (Participant 13). This macho, *'10-foot-tall and bulletproof'* ethos (Participant 1) created a barrier where officers felt they should be able to cope alone, and if they couldn't, it was a personal failing. Although participants did note that this stoicism culture is slowly changing, stigma remains a significant hindrance to coping efforts.

This cultural pressure was compounded by fears about career repercussions for those who sought help: *'People are still worried that if they open up . . . it's going to come back and affect their career'* (Participant 20). These concerns were not unfounded; Participant 17 described how *'when I raised my mental health condition*, [*my Officer in Charge's*] *solution was to have me moved out of the section'*. Such experiences reinforced officers' reluctance to seek internal support. As Participant 14 explained, *'Police won't generally use a lot of the internal help . . . and that just comes down to judicial risk . . . Generally, if they're going to seek help, they'll go outside the organisation where people can't get access to records'*.

These career concerns manifested in officers' reluctance to engage fully with formal psychological screening processes: *'We're all really bad at being honest with each other about our mental health'* (Participant 20). When describing the annual psychometric assessments, participants revealed a pattern of strategic non-disclosure designed to protect their careers. Participant 9 illustrated the routine nature of the screenings: *'That's just an email with a little link you click on and it's "Has your use of alcohol increased in the last six weeks?" No. "Have you used any illicit drugs?" No'*. His delivery suggested automatic responses rather than genuine

self-assessment. Others avoided the process entirely, with Participant 24 stating, *'They sent out an email like "here's a self-check". Delete'*. This pattern of avoidance and socially desirable responding undermined the effectiveness of existing support systems and perpetuated a cycle where officers' actual psychological needs remained hidden and unaddressed.

These barriers to reporting psychological impact underscore the need for proactive, preventative approaches to monitoring and managing traumatic exposure. The 'Welfare Module' is devised to bypass officers' challenges in identifying and flagging changes in their wellbeing. For instance, officers would not be asked to report *their own feelings* towards a scene, they would be asked to report *the scene's* impact rating because individuals are generally more willing to provide truthful answers to indirect questions, particularly when addressing sensitive topics[33–35].

Perceived inefficacy

Many officers viewed available support measures as inadequate or overly bureaucratic. A common frustration was the inconsistent and seemingly arbitrary nature of organizational outreach. As Participant 16 observed, *'You might get an email from an HSO for a suicide one week and then go to two next week and never hear from them. We just don't understand what they select as the one to inquire about'*. When support was offered, it often felt perfunctory.

Another fundamental barrier was the perceived inability of external professionals to understand police trauma and provide appropriate support. Officers felt civilian psychologists lacked necessary contextual knowledge, with Participant 14 explaining that *'non-police don't understand'* and emphasizing that effective professionals needed *'some sort of link or understanding or background in this field'*.

Practical barriers further undermined access. The system placed the burden on officers to seek help, yet, as Participant 9 noted, *'if I get depressed, I don't want help ... when you're in that mindset, you don't actually want to help yourself'*. This highlighted a crucial paradox: the hardest time to ask for help is when you most need it. Several participants acknowledged that during periods of anxiety or depression, they withdrew and avoided reaching out, meaning that relying solely on self-referral allowed many to slip through the cracks. Even for those willing to seek help, timing remained problematic. Officers needed immediate post-incident support, but existing systems often failed to deliver. As Participant 8 explained: *'If I am a mess, I need to talk to someone right there and then ... I've never really spoken to anyone because they weren't available when I needed them'*.

To bolster consistent and appropriate post-scene support for officers, the 'Welfare Module' should include a three-tier assistance framework (see Figure 2). First, when a user saves a record involving a deceased person or other distressing case elements, a contextual pop-up should offer the choice to request contact from peer support, formal mental health services, or to decline support. Second, if an officer's cumulative exposure crosses organizationally defined thresholds over a rolling time period, the system should automatically trigger the appropriate level of support without requiring the officer to self-refer. Third, a persistent emergency-help icon in the forensic-register's header would allow any user to signal immediate crisis, triggering real-time notification with location details to supervisors,

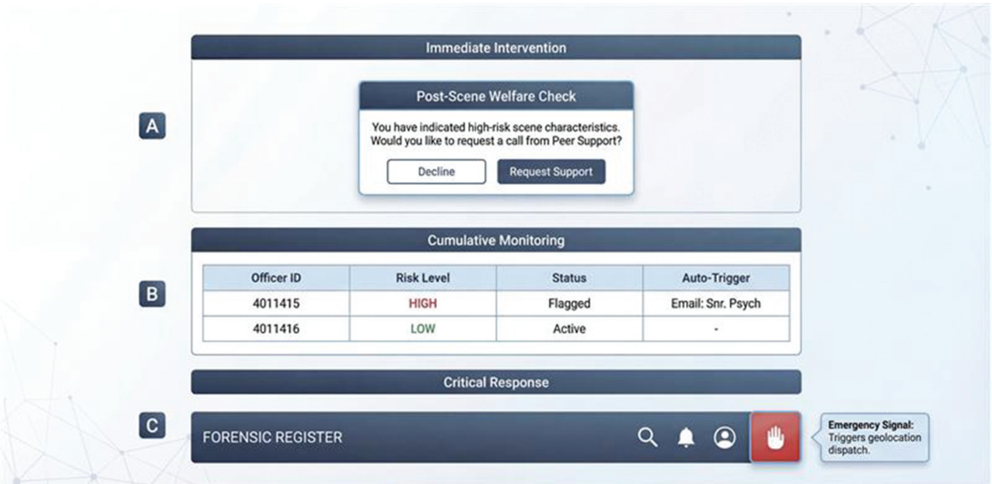

Figure 2. The responsive support framework. *Note*. The three-tier responsive support framework: (A) contextual pop-up for voluntary post-scene support, (B) cumulative exposure monitoring with automated intervention triggers, and (C) persistent emergency signal for acute crisis.

mental health professionals, and communications centres for rapid response critical support.

Protecting others

A significant barrier to coping emerged from officers' desire to shield their loved ones from the harsh realities of their work. Many participants deliberately engaged in self-censorship to prevent vicarious trauma – the psychological impact that could result from sharing graphic details with family and friends. As Participant 3 explained, *'I don't want their reality to be the same as my reality … I don't need you to know that this world exists … that people treat each other that way'*. This created an unavoidable paradox: officers were correct to protect their loved ones from traumatic content, yet this necessary choice left them with fewer outlets for processing their experiences and intensified their dependence on workplace support systems. It is critically important that the module triggers debriefs automatically rather than waiting for officers to put their hands up.

Discussion

Our findings indicate that traumatic impact in forensic investigation is not determined by scene characteristics alone, but rather by the interaction between scene-specific factors (such as child victims, advanced decomposition, or unexpected discoveries), officer-specific vulnerabilities (including recent parenthood, cumulative fatigue, or concentrated exposure to similar case types), and the availability of organizational support mechanisms following attendance. Critically, these individual and contextual factors remain largely invisible within current supervisory practices. Case allocation typically proceeds according to officer availability rather than psychological capacity, with limited systematic assessment of cumulative exposure or personal risk factors. The 'Welfare Module' proposed here

addresses this gap by capturing scene-level risk indicators alongside longitudinal tracking of individual officers' exposure histories. This approach enables more informed deployment decisions and facilitates earlier and more consistent support.

These findings align with and extend several existing frameworks. Managing occupational stress in forensic personnel requires attention to work practices, lifestyle factors, and organizational culture rather than focusing narrowly on individual pathology[36]. The risk markers identified in our interviews – particularly the compounding effects of cumulative exposure, workplace constraints, and organizational stigma – support this view. Existing assessment frameworks for occupational stress similarly emphasize the need for systematic, organizational-level monitoring[37], which the Welfare Module is designed to operationalize within existing case management infrastructure. Most directly, socio-ecological models of risk for vicarious trauma foreground primary prevention strategies[38]; the module's automated exposure tracking and tiered support triggers represent one concrete implementation of this preventative orientation. By embedding welfare monitoring into the routine workflow of the forensic register, the module moves beyond reactive, individual-level interventions towards the structural, systems-level approach that prior work in this area has advocated for.

Forensic-register recommendations

As described in the introduction, the forensic-register is Australia's predominant case management system. Because it already captures scene attendance, exhibits, and analytical workflows, it provides a natural platform to extend routine logging to include a small set of trauma-relevant fields and to compute longitudinal exposure metrics.

To reduce cumulative exposure while maintaining operational capacity, we recommend incorporating a software module that calculates each officer's *recovery period* (number of days since last death scene), *exposure frequency* (number of deaths attended in rolling time windows), and *time on scene* (hours spent exposed to material on and off each scene). To monitor exposure to *scene characteristics* that predict investigator distress, we recommend integrating binary or small-scale input features to indicate the presence or degree of vulnerable victim involvement, visible grief, and sensory burdens (decomposition or graphic injury). To capture traumatic impact without directly querying mental health status (reducing stigma-related reporting barriers), we recommend including a scene *impact rating* – a numerical scale that prompts a fast, intuitive judgement of how confronting each scene was for each officer.

As a longer-term aspiration, the module architecture could support machine learning algorithms that use *scene characteristics* to predict *impact rating*. Comparable approaches have been applied in oncology, where machine learning models trained on demographic, clinical, and lifestyle variables successfully predicted individual breast cancer patients' psychological resilience outcomes and identified person-specific risk factors to guide personalized interventions[39]. Applying similar logic here would allow the system to continually learn at both the group and individual level the hierarchy and interactions of various scene characteristics. For example, family attendance might be generally more impactful at scenes of suicide than at those of accidental death, but for a particular officer, that effect might be reversed. Crucially, while the model's initial design specifications are derived from 26 retrospective interviews (similarly to models

trained on static datasets), the algorithm itself would learn from every officer who uses the system, across every jurisdiction in which the forensic-register is deployed. Over time, its predictions would be informed not by a small reflective sample, but by thousands of real-time scene records and impact ratings, progressively strengthening the empirical basis of the module far beyond what any single qualitative or quantitative study could achieve.

To optimize officer deployment (when resources allow), we recommend *case allocation logic* that prioritizes officers with the lowest and most distant *exposure metrics*, the lowest *cumulative intensity score* in a rolling window, and no recent clusters of similar *scene characteristics*. We recommend the addition of *demographic-based filtering* to reduce assignments that are personally relevant. The system could allow for basic, voluntarily provided officer profiles that flag potential clashes of parental status, caregiving responsibilities, and recent significant life events. To bolster consistent and appropriate post-scene support, we recommend a three-tier assistance framework. First, when an officer saves a record involving a deceased person or other distressing case elements, a contextual pop-up should offer the choice to request contact from peer support, formal mental health services, or to decline support. Second, if an officer's cumulative exposure crosses organizationally defined thresholds over a rolling time period, the system should automatically trigger the appropriate level of support without requiring self-referral. Third, a persistent emergency-help icon in the forensic-register's header should allow any user to signal immediate crisis, triggering real-time notification with location details to supervisors, mental health professionals, and communications centres for rapid response.

Several limitations warrant acknowledgement. First, all participants were recruited from the Queensland Police Service, and although the forensic-register is used across Australia, operational practices, organizational cultures, and support structures may differ across Australian jurisdictions. The risk markers and barriers identified here may not fully represent the experiences of forensic personnel in other states or territories. Second, the module cannot predict or record all potential risk factors, particularly those arising from surprise or personalization. Third, operational staffing constraints may limit the extent to which exposure-informed allocation can be practically applied. Fourth, the proposed support triggers are derived from qualitative findings and remain hypothetical until validated through implementation research; they should be treated as empirically grounded design specifications rather than tested interventions. Finally, certain recommendations – particularly the application of machine learning to predict impact ratings – extend beyond what was directly tested in this study and should be understood as future directions informed by, but not validated within, the present work. Future research should validate these specifications across jurisdictions with input from personnel in other states and territories, examine their feasibility in real-time deployment, and assess whether such system-level changes measurably reduce distress, disability, and attrition in forensic and first responder populations.

This study highlights how specific scene characteristics, cumulative operational demands, and systemic barriers to help-seeking converge to place forensic investigators at sustained risk of psychological harm. By identifying traumatic impact intensifiers and barriers to coping and translating these findings into modular changes to the forensic-register, we demonstrate a pathway from individual narratives to structural, data-driven

prevention. Integrating exposure metrics, scene-level risk features, and automated impact-responsive support into routine case management offers a means to distribute workload more safely and to trigger timely, proportionate interventions without requiring stigmatized self-disclosure.

Disclosure statement

In accordance with Taylor & Francis policy and our ethical obligation as researchers, we are reporting that AH is affiliated with the commercial company bdna, and DM is affiliated with the government organisation Queensland Police Service. This research may inform the development of a product by bdna which may be licensed to Queensland Police Service. Because neither company nor the researchers have any vested interest in the particular outcome of this research, there are no conflicts of interest regarding the pattern of findings

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Declaration of generative AI and AI-assisted technologies

During the preparation of this work, the author (s) used ChatGPT (OpenAI) and Gemini (Google) to assist with qualitative thematic analysis and the initial drafting of the manuscript. Additionally, Gemini 3 Pro (Google) was used to assist with the design and generation of the conceptual figures (Figures 1 and 2). After using these services, the author(s) thoroughly reviewed and edited all material as needed and take full responsibility for the content of the published article.

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