What would you like? Identifying the required characteristics of an industry-wide incident reporting and learning system for the led outdoor activity sector

Natassia Goode[1], Caroline F. Finch[2], Erin Cassell[3], Michael G. Lenné[3] and Paul M. Salmon[1]

[1]University of the Sunshine Coast, [2]Federation University Australia,

[3]Accident Research Centre, Monash University

Abstract

The aim of this study was to identify the characteristics that led outdoor activity providers agree are necessary for the development of a new industry-wide incident reporting and learning system (UPLOADS). The study involved: 1) a literature review to identify a set of characteristics that are considered to be hallmarks of successful reporting and learning systems in other safety-critical domains; and (2) the presentation of these characteristics to 25 Australian led outdoor activity providers using a two round modified-Delphi technique to obtain consensus views on their relative importance in this domain. Thirteen out of 30 characteristics were endorsed as "essential" for developing an incident reporting and learning system for the led outdoor activity sector, and a further 13 were endorsed as "required". "Essential" characteristics primarily related to operational or practical characteristics of the system, while "required" characteristics primarily related to system infrastructure, data quality and the basis for developing of countermeasures to address identified injury risks. The findings indicate that although led outdoor activity providers are primarily concerned that the demands of reporting do not adversely impact on their day to day operations, they also recognise that data collection methods and countermeasure development need to be of high quality. The paper concludes by highlighting some potential strategies for implementing the characteristics considered "essential" and "required".

Keywords: Incident database, risk management, safety, outdoor activity

Introduction

The goal of the UPLOADS (Understanding and Preventing Led Outdoor Accidents Data System) project is to develop a standardised, national approach to incident reporting and learning for the outdoor sector in Australia. The project is funded by a range of stakeholders in the outdoor sector, including outdoor education and recreation associations, outdoor activity providers and government departments (see acknowledgements). The system is primarily aimed at organisations which facilitate supervised or 'led' outdoor activities (i.e. led outdoor activity providers). This is a diverse group which includes organisations operating under the banners of outdoor education, school camps, adventure tourism, outdoor recreation and outdoor therapy. While these organisations pursue a range of different goals in the provision of outdoor activities, they all owe a duty of care towards those involved in their activities (e.g. instructors, participants, volunteers) to eliminate or manage the risks involved as far as reasonably possible. Moreover, the provision of common activities (e.g. bushwalking, camping, rock climbing) implies that these different types of organisations may be able to learn from one another's experiences.

Gathering detailed information on incidents and identifying contributing factors is a valuable component of risk management in outdoor programmes. Incident rates can be used to evaluate the efficacy of risk management decisions or countermeasures over time (Cessford, 2009), and identify when changes to risk management strategies are necessary (Leemon & Schimelpfenig, 2003). Information on contributing factors provides an empirical basis to justify changes to policy, training, or program location or activity (Brown & Fraser, 2009; Capps, 2007; Dickson, 2012a; Haddock, 2008; Merrill & Wright, 2001). Incident reports, if accessibly stored, can help retain organisational knowledge despite staff turnover (Haddock, 2008). In addition, actual data on incidents can provide a basis for communicating with participants and their families about the real, as opposed to the perceived, risks involved in outdoor activities (Leemon & Schimelpfenig, 2003).

While collecting incident data at the organisation level has benefits, a national system compiling information on all led outdoor incidents, including near misses, would provide further benefits to the sector as a whole. First, a standardised, national system would potentially provide a common language for cross-organisational communication and learning within a very diverse 'sector' (i.e. those involved in the provision of led outdoor activities). Second, while

acknowledging that the data would be gleaned from a diverse set of organisations, analysing aggregate data would potentially provide insights into the risks associated with different types of led outdoor activities. The types of activities facilitated by outdoor recreation, education or adventure organisations are typically seen as relatively high risk compared with traditional sports (Cessford, 2009; Dickson, 2012b; Priest & Baillie, 1987). Without empirical evidence, judgements about these activities, and their relative risks and benefits, will continue to be made on the basis of personal opinion (Brown & Fraser, 2009; Cessford, 2009). Comprehensive data, including participation rates, would assist professional associations and government agencies to make evidence based decisions about issues that affect those involved in the provision of led outdoor activities (Brown & Fraser, 2009; Dickson, 2012b; Salmon, Williamson, Lenne, Mitsopoulos-Rubens, & Rudin-Brown, 2009).

The initial plan for UPLOADS was developed from a review of the literature on guidelines for developing and evaluating injury surveillance and adverse event reporting systems in other areas such as healthcare (e.g. German et al., 2001; Holder et al., 2001; Klaucke et al., 1988; WHO World Alliance for Patient Safety, 2005). However, given the differences between the healthcare system and the outdoor sector, it is uncertain that such principles are directly transferrable. Historically, directly transferring risk management practices from other industries into the led outdoor activity context has proved problematic because outdoor activities inherently involve a number of risks that cannot be minimised without changing the essential nature of the activity (Hogan, 2002). In addition, outdoor activity providers may lack the infrastructure and resources to fully support the implementation of safety management systems used in healthcare.

Therefore, this study sought to determine which of the characteristics of "good" or "successful" incident reporting systems are considered necessary for the development of a standardised, national approach to incident reporting by potential contributors to UPLOADS, and those that are seen as less important. The Delphi technique was utilised to gain a consensus view, in recognition that there are many different types of organisations in this diverse sector. In addition, providers were asked about their current incident reporting systems to determine how UPLOADS might fit within these practices. This study represents one of the first components in the development of the UPLOADS prototype system.

The paper begins with a review of the systems that currently capture data on incidents during led outdoor activities, in order to provide further justification for the development of a national incident reporting and learning system. The results of the study are then presented. Finally, implications for the development of the UPLOADS prototype system are discussed.

Data collection on led outdoor activity incidents

The first level of Figure 1 shows the types of led outdoor activity providers that UPLOADS is intended to cater for; the subsequent levels show the associated reporting schemes. Dotted feedback loops represent the *potential* for internal reporting schemes within each type of organisation. Mandatory reporting schemes are represented by arrows linking the type of provider to the scheme. Also represented are voluntary schemes maintained by professional bodies and associations which encourage instructors registered with the association to report activity-specific incidents.

Figure 1 illustrates that most organisations already have significant reporting responsibilities, internal and external. For example, many not-for-profit organisations have developed their own bespoke incident reporting systems (e.g. Outward Bound Australia has developed the Outdoor Medical Incident Database over the past 25 years (http://www.outwardbound.org.au/about-us/safety.html). In addition, in not-for-profits incidents involving state government students or employees would be reported to the relevant school administration and state government education department. In contrast, incidents involving independent school students or employees would be reported to the scheme particular to that school. Serious injuries (i.e. those requiring immediate treatment as an in-patient) and fatalities would also be reported to the occupational health and safety (OHS) regulatory system in the relevant state (e.g. WorkSafe VIC).

Figure 1 also shows that incident reporting and learning in the Australian sector is highly fragmented. Little information is available regarding the *actual* prevalence of internal reporting systems within the sector, their quality or their impact on safety. The only overarching scheme, gathering data from all led outdoor activity providers, is the OHS regulatory system in each state. The situation was similar in New Zealand prior to the introduction of the National Incident Database (NID) (Cessford, 2009, 2010).

While the OHS regulator in each state does capture data on serious injuries and fatalities in outdoor activities, this data is limited for the purposes of developing a realistic picture of the risks faced during outdoor programs. First, the absence of participation or exposure data precludes calculation of the risk of injury or fatality in the activities where these incidents occur (Dickson, 2012a). Second, given that serious injuries and fatalities appear to be

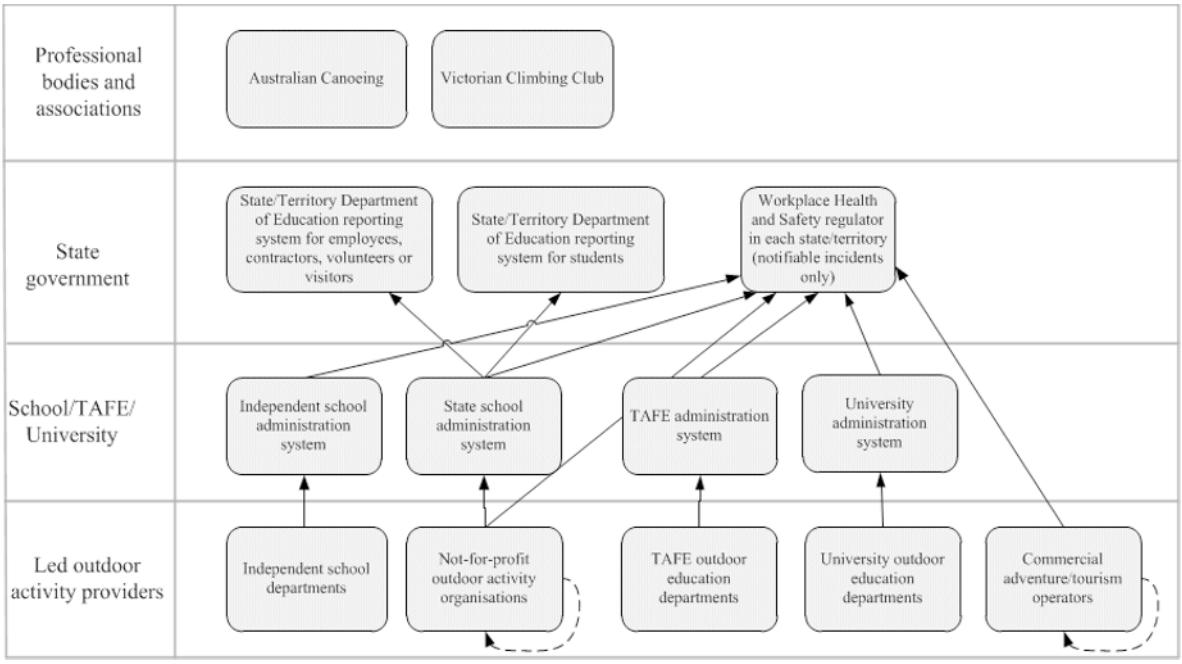

Figure 1: Led outdoor activity providers' reporting responsibilities.

relatively rare in outdoor programmes (Brookes, 2003, 2007, 2011; Cessford, 2009, 2010; Hill, 2011) relying on this data in isolation would result in a biased view of led outdoor activities incidents.

There are also a number of injury surveillance systems that potentially capture data on injuries resulting in hospital admissions and fatalities during outdoor programmes. At a nationwide level, there is the National Coronial Information System (NCIS), the Australian Bureau of Statistics (ABS) mortality unit record data and the Australian Institute of Health and Welfare (AIHW) National Hospital Morbidity Database. At a state level, there is Victorian State Trauma Registry, Victorian Injury Surveillance System, the Admitted Patient Data Collection (NSW), the Queensland Injury Surveillance Unit and Kidsafe WA among other hospital collections.

Although injuries during outdoor programs are undoubtedly captured by these systems, retrieving data on specific incidents would be difficult. In Australia, health sector databases use a modified version the International Classification of Diseases (ICD-10-AM) which has over 200 activity codes to identify specific sports and leisure activities associated with injuries. However, it has been found that a large number of cases have an unspecified or missing activity code (Finch & Boufous, 2008). Moreover, specific codes are not included for many activities which form the core of outdoor programmes (e.g. camping, high ropes). Nor do the codes distinguish between activities which take place within the context of a facilitated and managed program, and those that are undertaken independently (Mitchell, Boufous, & Finch, 2008). This is particularly problematic considering that New Zealand Accident Compensation Corporation (ACC) data indicates that outdoor activities undertaken independently are associated with more claims than those undertaken commercially (Bentley & Page, 2008; Bentley, Page, & Macky, 2007). Thus, reliance on hospital data collections would lead to biased estimates of the risks involved in facilitated or instructed outdoor activities.

Putting aside the difficulties associated with identifying relevant incidents, such data has similar limitations as those associated with the OHS regulatory reporting systems in each state (i.e. lack of participation data, focus on serious injuries and fatalities). In addition, the type of data collected is extremely limited, precluding the identification of possible causation and risk factors.

The situation described above suggests that there is some justification for the development of a nationwide, standardised approach to incident reporting and learning in the outdoor sector. This not a newly identified need. There have been previous nationwide reporting systems in Australia, such as the Australian Accident Register (AAR) and the National Accident Incidence Report Form Database (NAIRFD). The U.S. based Wilderness Risk Management Committee (WRMC) Incident Report Project also maintained an Australian database (Brackenberg, 1999). All of these systems are now defunct, due to a lack of funding. This does not mean, however, that they were not useful. In particular, at an international level the findings from WRMC database resulted in significant advancements in the understanding of the types and severity of incidents that occur during outdoor programs (Leemon, 2002). Systems such as New

Zealand's NID also illustrate the success that can be achieved at a sector level (Cessford, 2009, 2010; Hill, 2011). Potentially, the NID has managed to survive because it is more than just a national incident repository. It provides an electronic management system that organisations can maintain on their own terms, and this motivates participation by giving them control over their own data.

This review illustrates why early engagement with outdoor activity providers in the UPLOADS project is so critical. Many of them already have significant reporting responsibilities. However, there are clear benefits of a national, standardised approach. The aim of the current study was to determine what characteristics outdoor activity providers consider to be essential for the development of UPLOADS, in order to better understand the constraints on participation.

Methods

The identification of the required characteristics for UPLOADS involved a two stage process. First, a literature review was conducted to identify an initial set of characteristics that are considered to be hallmarks of successful injury surveillance and adverse event reporting systems. Second, the identified set of characteristics was presented to a group of Australian led outdoor activity providers using a two round modified-Delphi technique to obtain consensus views on their relative importance in this domain.

Stage 1 Identification of characteristics of successful systems

The aim of this stage was to conduct a review of the literature to identify the characteristics that are considered to represent the hallmarks of successful incident reporting and learning systems. The starting point of this investigation was the guidelines for evaluating public health and injury surveillance systems and adverse event incident reporting and learning systems published by the Centre for Disease Control (CDC and World Health Organisation (WHO) (German et al., 2001; Holder et al., 2001; Klaucke et al., 1988; WHO World Alliance for Patient Safety, 2005), as these were themselves based on comprehensive literature reviews and advice from expert panels. A search was then undertaken for later publications that expanded on or reviewed these guidelines (or earlier publications in reference lists of the above reports if they appeared to add value).

Stage 2 Assessment of characteristics by Australian led outdoor activity providers

The aim of this stage was to gain consensus from Australian led outdoor activity providers on which of the characteristics identified in Stage 1 are necessary for UPLOADS. A two round online modified Delphi technique (Linstone & Turoff, 1975) was used to reach consensus without engaging participants in direct discussion. This involved participants completing two online questionnaires, in which they rated the importance of the characteristics identified in Stage 1. It was decided that, for the purposes of the study, consensus would be said to exist when at least 80% of respondents agreed. Although more conservative than the level used in other Delphi studies (Hasson, Keeney, & McKenna, 2000; Keeney, Hasson, & McKenna, 2006), this criteria was selected because it would not be possible to implement all characteristics in the UPLOADS prototype given the financial constraints of the project. To aid in the rating process, each characteristic was defined in relation to how it would be implemented in UPLOADS (see Table 1). Participants were provided with feedback on the views of the group between rounds, so that they could see whether their views aligned with others, and change their opinions if desired. The online Delphi technique was selected over in-person group discussions for a number of reasons, including: led outdoor activity providers are widely distributed around Australia; the anonymity of responses could be maintained; it provided a forum where all opinions could be considered equally; and this technique had previously been adopted by one of the authors in another safety context (Donaldson & Finch, 2011). The protocol was approved by the Monash Human Ethics Committee, and is described in the following sections.

Participant recruitment

The study was advertised to led outdoor activity providers across Australia through emails and newsletters distributed by the UPLOADS project partners (see Acknowledgements) to their networks over a month. Led outdoor activity providers were asked to contact the research team via email if they were willing to participate.

Questionnaire development and administration

SurveyMonkey (http://www.surveymonkey.com) was used to develop the online questionnaires. At the start of each round, participants were emailed a hyperlink to the online questionnaire, and given one week to complete it. Non-responders were sent a maximum of three email reminders. There was approximately a two week break between each round, and the entire process was completed in August and September 2012. Copies of the questionnaires can be obtained directly from the corresponding author.

Round 1

Round 1 was used to gather information on current practices regarding incident reporting, the desired scope of the proposed system, and initial opinions on its characteristics of UPLOADS. Questions regarding current practices included: whether and what type of incident data is collected; how the data is collected; who can file reports; how the data is used; and whether follow-up investigations are conducted. Questions on the desired scope of the new system included: what type of incidents should be reported; how training for the system should be delivered (e.g. online, in-person, paper-based) and data collection options (e.g. paper-based forms and smart phone application). Participants were then presented with the list of characteristics identified in Stage 1, and asked to rate each as:

- ESSENTIAL – UPLOADS must have this characteristic;
- IDEAL – in an ideal world where money, time and other resources are unlimited, it would be good if UPLOADS had this characteristic; or
- NOT REQUIRED – this characteristic would be of no value or use for UPLOADS.

Round 2

In Round 2, participants were presented with a summary of the Round 1 ratings, and asked to re-rate the characteristics that did not reach consensus as either:

- YES – UPLOADS must have this characteristic; or
- NO – UPLOADS does not require this characteristic.

This gave participants an opportunity to revise their original ratings, and to more categorically state whether they thought the characteristic was required.

Data analysis

Questionnaire data from Round 1 and Round 2 was downloaded from SurveyMonkey and transferred into SPSS. Frequencies and percentages were generated for responses to each question.

Results

Stage 1 Identification of the characteristics of "good" or "successful" systems

In addition to the guidelines published by the CDC and the WHO systems (German et al., 2001; Holder et al., 2001; Klaucke et al., 1988; WHO World Alliance for Patient Safety, 2005) a number of articles were identified that reviewed and expanded on these guidelines (Auer, Dobmeier, Haglund, & Tillgren, 2011; Barach & Small, 2000; Drewe, Hoinville, Cook, Floyd, & Stark, 2012; Leape, 2002; Mitchell, Williamson, & O'Connor, 2009; Thomas, Schultz, Hannaford, & Runciman, 2011). From these sources a list of 30 characteristics was identified; a summary of the review is presented in Table 1 (pp. 6-7).

Stage 2 Assessment of characteristics by potential end-users of UPLOADS

Sample

Twenty-five led outdoor activity providers contacted the researchers to participate in the study. Of these all responded to Round 1 and 22 responded to Round 2, representing a 12% drop out. Participants were either managers or played a key role in managing safety within their respective organisation. The participant's organisations were based across Australia (11 in New South Wales, five in Queensland, five in Western Australia, three in Victoria and one in South Australia) and represented a diverse cross-section of the led outdoor activity sector including four school-based groups, seven government organisations, five faith-based organisations, six not-for-profit community organisations and three commercial providers.

Current incident reporting and learning practices

Almost all (92%) participants reported that their organisation already had an incident reporting system. However, the type of data collected and how it was collected varied across organisations. Of the organisations that were reported to have an incident reporting system, 100% collected data on injuries, 78% collected data on near misses (i.e. a serious error or mishap that has the potential to cause an adverse event but fails to do so because of chance or because it is intercepted; (WHO World Alliance for Patient Safety, 2005) and 78% collected data on property damage incidents. In addition, two participants reported that their organisation collected information on any occurrence resulting in the disruption of operations and incidents associated with adverse behavioural or psychological outcomes (e.g. bullying, stress, oppositional conduct). With regards to data collection methods, 100% of the organisations used paper-based forms and only 57% had electronic databases.

Table 1 List of characteristics of 'good' or 'successful' injury surveillance and incident reporting and learning systems identified in the literature and definitions presented to Delphi participants in Stage 2

Characteristic	Sources	Definitions presented to participants in Stage 2
Acceptability	German et al., 2001; Holder et al., 2001; Klaucke et al., 1988	Potential end-users can be involved in all stages of UPLOADS database development and refinement to ensure that it meets their needs.
Accessibility	Mitchell et al., 2009	There is an acceptable and reliable turnaround time between information request from the UPLOADS database and delivery.
Availability	Barach & Small, 2000	The UPLOADS database should be available to anyone wanting to report an incident or near miss
Clear case definitions	Mitchell et al., 2009	There is a clear definition of what should and shouldn't be entered into the UPLOADS database.
Clear purpose and objectives	Holder et al., 2001; Mitchell et al., 2009	There is a clearly defined reason why the UPLOADS database exists and how it is used.
Credible	WHO World Alliance for Patient Safety, 2005	Data tabulations and summaries of the UPLOADS data can be relied upon.
Data collection process described	Mitchell et al., 2009,	The UPLOADS data collection process and the number of steps involved is clearly documented.
Data completeness	German et al., 2001; Holder et al., 2001; Mitchell et al., 2009	A consistent amount of data is provided from every case (i.e. each form submitted to the UPLOADS database is completely filled out).
Data confidentiality and individual privacy	Barach & Small, 2000; Holder et al., 2001; Leape, 2002; Mitchell et al., 2009; Who World Alliance for Patient Safety, 2005	Neither specific individuals nor particular organisations are identifiable in outputs and data summaries generated from UPLOADS.
Ease of reporting	Barach & Small, 2000	Submitting a report to the UPLOADS database is as easy as possible.
Expert analysis	Leape, 2002; Who World Alliance for Patient Safety, 2005	The data stored within the UPLOADS database is interpreted by experts.
Flexibility	German et al., 2001; Holder et al., 2001; Klaucke et al., 1988	The UPLOADS database can adapt to meet new requirements (e.g. a new led outdoor activity can be added to the database readily).
Guidance material for data interpretation	Mitchell et al., 2009	UPLOADS reports clearly explain the results and what they mean.
Non–punitive	Barach & Small, 2000; Leape, 2002; WHO World Alliance for Patient Safety, 2005	Reporters of incidents or near misses are free from the fear of retaliation or punishment as the result of reporting to the UPLOADS database.
Positive predictive value	German et al., 2001; Klaucke et al., 1988; Mitchell et al., 2009,	The data entered into the UPLOADS database is an accurate description of the incident.
Quality control measures	Mitchell et al., 2009	The quality of the data entered into the UPLOADS database is monitored and maintained by researchers.

Table 1 continued

Characteristic	Sources	Definitions presented to participants in Stage 2
Representative-ness	German et al., 2001; Klaucke et al., 1988; Mitchell et al., 2009	Results from the UPLOADS database accurately represent how frequently incidents and near misses are occurring during led outdoor activities.
Responsive	Leape, 2002; Who World Alliance for Patient Safety, 2005	Stakeholders are committed to changing practices based on recommendations from UPLOADS.
Sensitivity	German et al., 2001; Holder et al., 2001; Klaucke et al., 1988; Mitchell et al., 2009	All relevant cases are entered into the UPLOADS database (i.e. all incidents that occur at the organisations involved in the project are entered into the database).
Simplicity	German et al., 2001; Holder et al., 2001; Klaucke et al., 1988	The UPLOADS database has a simple structure and is easy to operate.
Specificity	Mitchell et al., 2009	No irrelevant cases are entered into the UPLOADS database.
Stability of the system	German et al., 2001	The UPLOADS database should be reliably available for data input at all times.
Sustainability of the system	Holder et al., 2001	Participating organisations should be able to easily maintain and update the UPLOADS database.
Sustained leader-ship support	Barach & Small, 2000.	Organisations involved in the project should be committed to contributing data on an on-going basis.
System security	Holder et al., 2001; Mitchell et al., 2009	The data entered into the UPLOADS database is password protected.
Systems–oriented	Leape, 2002; WHO World Alliance for Patient Safety, 2005	UPLOADS recommendations focus on changes that could or should be made to policies, procedures or activities, rather than being targeted at instructors.
Timeliness	Barach & Small, 2000; German et al., 2001; Holder et al., 2001; Klaucke et al., 1988; Leape, 2002; Mitchell et al., 2009; WHO World Alliance for Patient Safety, 2005	There is rapid turnaround between data collection and reporting meaningful information to stakeholders.
Use of uniform classification systems	Mitchell et al., 2009	The UPLOADS classification system is clearly described in a manual that is easily accessible.
Usefulness	German et al., 2001; Klaucke et al., 1988; Mitchell et al., 2009	The data summarised from the UPLOADS database can be used to identify ways to reduce incidents and near misses.
Utility	Holder et al., 2001	The UPLOADS data collection process is practical and does not place an undue burden on participating organisations or the people who contribute to it.

With regards to who is able to file reports, 100% said managers could file reports, 87% said instructors could file reports, 74% said administrative staff could file reports, and 22% said participants could file reports.

Organisations reportedly used this data for multiple purposes. Amongst those who indicated that they had an incident reporting system, 87% said the data was used to inform changes in policy and practice; 83% said it was collected for legal purposes; 70% said it was for insurance purposes; 70% said it was to track potential problems with specific staff or instructors; and 65% said it was to develop training programs, resources or other educational material. Other reasons for collecting incident data were reported as, including: raising awareness of the potential for incidents; legislative requirements of state government; keeping track of medical histories; and tracking trends and potential problem areas within the organisation.

In relation to post-incident investigations, 22% of participants reported that they were conducted for all incidents, while 78% reported that they were only conducted for more serious incidents. In terms of how this data is subsequently stored, 53% of participant reported that investigation outcomes are entered into a database.

Desired scope of UPLOADS

All participants agreed that UPLOADS should collect data on incidents where a person was injured; 96% agreed that it should collect data on near misses; and 76% agreed that it should collect data on incidents where property was damaged. In addition, participants proposed that UPLOADS should collect data on incidents with behavioural or psychological outcomes and any incident that has capacity to impact adversely on outdoor led activities (e.g. environmental hazards). In terms of the type of injury data that should be collected, 56% stated that information on all injuries should be collected, 36% stated that data should only be collected on more serious injuries and 8% stated they were unsure.

For the delivery of training on UPLOADS, 72% of participants wanted an online manual, 76% wanted an online video tutorial, 52% wanted a hands-on seminar and 24% wanted a paper-based manual.

For the collection of data (i.e. incident reporting), 84% of participants stated they wanted paper-based forms in addition to an electronic database, and 88% stated that they would like a smart phone interface for the electronic database.

Initial assessment of potential UPLOADS characteristics provided to Delphi participants

Of the 31 characteristics provided to the Delphi participants, there was consensus (defined as ≥ 80% agreement, n = 20) that 13 of them were essential for the UPLOADS database, as shown in Table 2 (p. 10). There was no consensus on the remaining characteristics.

Secondary assessment of characteristics

In Round 2, participants were re-presented with the 17 characteristics without consensus from Round 1, together with Round 1 agreement levels. There was consensus (defined as ≥ 80% agreement, n = 18) that 13 are required in the development of UPLOADS. Four items did not reach consensus (Table 3) (p. 11).

Discussion

Overall, the characteristics considered to be hallmarks of successful adverse event reporting systems in healthcare also appear to be highly relevant to led outdoor activity providers. In Round 1, participants reached consensus that 13 out of 30 characteristics are "essential" for developing UPLOADS, and a further 13 were endorsed as "required" in Round 2. No consensus was reached on four characteristics.

The characteristics that were considered "essential" by led outdoor activity providers will now be considered as a first priority in the development of UPLOADS. Table 4 (p. 12) outlines the strategies that will be used to implement these characteristics within UPLOADS. These characteristics highlight two key issues: the need to minimise the workload associated with the database (e.g. ease of reporting, utility, simplicity) and the need for confidentiality in contributing data to the national system (e.g. non-punitive, individual privacy). The first issue is perhaps unsurprising considering the significant reporting responsibilities that already exist for many within this context. UPLOADS will need to have the capability to import data from other systems, and include functions that encourage efficiencies, such as one central system for storing incident, participant and staff details. The second issue perhaps reflects concerns with the legal ramifications of contributing data to a national system. In order to protect individual and organisational privacy, the design of UPLOADS will need to ensure that only deidentified data is contributed to the national system. Moreover, appropriate risk management strategies will need to be put in place to protect the voluntary nature of participation in the project.

Table 2 Participant's ratings of each characteristic as essential, desirable but not critical or not important in Round 1 (n = 25)

Characteristic	Essential	Desirable but not critical	Not important
Utility	24	1	
Usefulness	24	1	
Ease of reporting	24	1	
Clear case definitions	24	1	
Representativeness	23	2	
Positive predictive value	23	2	
Non-punitive	23	2	
Credible	23	2	
Use of uniform classification systems	22	3	
Sustainability (system)	22	3	
Simplicity	22	3	
Data confidentiality and individual privacy	21	2	2
Guidance material	21	4	
----------	----------	----------	----------
Data collection process described	19	6	
Clear purpose and objectives	19	6	
System security	18	5	2
Systems-orientated	17	7	1
Sensitivity	16	9	
Data completeness	16	9	
Stability of the system	15	10	
Sustained leadership support	14	10	1
Flexibility	14	11	
Availability	14	11	
Expert analysis	13	9	3
Quality control measures	13	12	
Accessibility	13	12	
Acceptability	13	12	
Specificity	9	14	
Responsive	7	16	2
Timeliness	7	17	

----- represents the cutoff point for consensus of $n \geq 20$

Table 3 Participants ratings of each characteristic in Round 2 (n = 22)

Characteristic	Required	Not required
Clear purpose and objectives	22	0
Data collection process described	22	0
Accessibility	22	0
Flexibility	22	0
Stability of the system	21	1
Quality control measures	20	2
Systems-orientated	20	2
Sustained leadership support	19	3
System security	18	4
Data completeness	18	4
Sensitivity	18	4
Availability	18	4
Specificity	18	4
---	---	---
Responsive	17	5
Expert analysis	16	6
Timeliness	16	6
Acceptability	15	7

----- represents the cutoff point for consensus of n ≥ 18

The characteristics that were considered as "required" will be considered as a second, though still important, priority in the development of UPLOADS; equating to desirable but not critical as defined in Round 1. Table 5 (p. 13) outlines the strategies that will be used to implement these characteristics within UPLOADS. These characteristics were related to the system infrastructure, data quality and the basis for developing countermeasures to address identified injury risks. This suggests that led outdoor activity providers realise that in order to gain credibility within the industry and, to be able to make evidence-informed decisions about prevention, UPLOADS data collection methods and countermeasure development need to be scientifically defendable and of high quality.

The finding that no consensus was reached on four characteristics indicates that these could be considered as optional in the development of UPLOADS. These characteristics primarily relate to the analysis of the data (e.g. responsive, expert analysis and timeliness). On the one hand, these issues may have been seen as less important because they are outside the direct control of potential end-users (i.e. they are the responsibility of the group maintaining the system). On the other hand, this may also indicate that more work needs to be done to develop interest in dissemination and the development of countermeasures, and that led outdoor activity providers may not yet realise the value that can be added to current practices through the analysis of incidents. From a practical perspective, there would be little point in continuing the project if stakeholders were not committed to changing practices based on recommendations from UPLOADS.

In addition, the study found that multiple data collection and training methods are considered important. A smart phone app interface for UPLOADS was considered to be as desirable as paper-based forms. Online training (manual and video) was seen as more desirable than hands on seminar and paper manuals.

The investigation of current practices confirms that most organisations operate an internal reporting system; however there is a lack of standardisation across organisations. The organisations differed in terms of the type of data they collect, why they collect it and how they collect it. In particular, not all organisations collected data on near misses, which potentially signal conditions that might lead to serious incidents (Brackenberg, 1999; Brown & Fraser, 2009; Davidson, 2004; Haddock, 1999). The finding that only two organisations collected information on incidents associated with adverse behavioural or psychological outcomes might potentially be explained by differences in the types of organisations that participated in the trial (i.e. organisations involving school age children are more likely to be concerned with bullying than other types of organisations). Further research is required to determine whether the

Table 4 Implementation strategies for characteristics considered to be "essential"

Characteristic	Potential implementation strategies
Utility	• The system minimises double entry of information • Ability to import information from other reporting/administration systems
Usefulness	• Tools for analysing the data, as well as collecting it • Training material on how to develop appropriate countermeasures from findings • Committee to develop appropriate, sector-wide initiatives from findings
Ease of reporting	• Staff can access electronic and paper-based reporting forms at any time
Clear case definitions	• Incident severity scale to clearly define the type of incidents to be reported • Clear definitions of "near miss" and "incident"
Representativeness	• System to support the collection of participation data in addition to incident data • Data submitted to the nationwide database in deidentified format, to discourage "deletion" of sensitive cases
Positive predictive value	• Each incident report reviewed by activity manager within the organisation • Where appropriate, all the people involved in the incident to contribute to and review incident reports
Non-punitive	• Individual reports cannot be linked back to organisations within the nationwide database • Training material for organisations on how a "just culture" supports reporting
Credible	• Nationwide data to be analysed by a qualified researcher • Nationwide reports undergo a peer review process before release
Use of uniform classification systems	• Domain-specific taxonomy to code the causal factors involved in incidents • ICD-10 codes used to classify injury types • Incident severity scale to classify incidents
Sustainability (system)	• UPLOADS should not require any special computer skills to operate it • Sufficient training materials provided so that operation of the system can be handed over if staff member leaves
Simplicity	• The prototype system will be reviewed by multiple stakeholders to ensure it is intuitive and domain-appropriate
Data confidentiality and individual privacy	• Nationwide data reported at the aggregate level only • Limits to be set around the reporting of incident types (e.g. more than 3 kayaking incident required to report on this type of incident)
Guidance material	• Reports on the nationwide data to be written in lay language • Guidance on interpreting complex analyses provided in lay language

scope of UPLOADS needs to be widened to address different types of adverse outcomes; at this stage the project is primarily focussed on injury prevention.

A critical finding is that only 57% of those surveyed had access to an electronic database. This makes it difficult to analyse trends over time or calculate the risks associated with particular activities. This indicates that UPLOADS will benefit many outdoor activity providers at an organisational level by making it easier to keep track of and learn from the incidents occurring in their organisation. However, it should be acknowledged that the investigation of current practices was a limited aspect this study; further research is required to develop a more detailed picture of current practices, particularly with regards to accident analysis and countermeasure development.

Finally, the limitations of the study should be acknowledged. Participants were volunteers, who may have potentially been more concerned about database issues than non-responders. Moreover, the study included only managers or staff in a safety management role; potentially a different set of characteristics would be identified by instructors. The study also sampled only a relatively small proportion of potential end-users. However, the fact that participants were from organisations that represent a diverse cross-section of the sector indicates that the views of the sample are likely to be generally representative. There are also limitations associated with prioritising certain characteristics based on management priorities. For example, the findings would not be acceptable for peer reviewed publication in the wider safety literature if they did not undergo expert analysis. Similarly, it would not be possible to develop a domain appropriate system without the involvement of end-users in all stages of development.

Table 5 Implementation strategies for characteristics considered to be "required"

Characteristic	Potential implementation strategies
Clear purpose and objectives	• The type of outdoor organisations that UPLOADS is intended to service clearly defined • The type of activities that UPLOADS collects data on clearly defined • The potential uses of the data will be clearly defined
Data collection process described	• A flow diagram will be constructed to illustrate the steps involved in the data collection process
Accessibility	• Clear dates set for the release of nationwide reports • Requests for specific data analyses to be negotiated on a case basis
Flexibility	• Additional fields can be added to the database to meet the needs of individual organisations • Easy to update the UPLOADS software
Stability of the system	• The UPLOADS software will run on PCs within each contributing organisation, to avoid potential issues with a central sever • The UPLOADS software will not rely on a connection to the internet
Quality control measures	• Researchers will conduct periodic studies to assess the reliability and validity of the coding taxonomy • Researchers will conduct periodic checks to ensure the database fields are being used correctly
Systems-orientated	• UPLOADS will be based on Rasmussen's (1997) Risk Management Framework, a widely accepted systems-orientated accident causation model
Sustained leadership support	• Organisations commit to contributing data for specified periods of time (e.g. 1 year), after which they may choose to opt-out • Peak bodies and professional associations promote UPLOADS as best practice within the sector
System security	• Organisations manage their own data, and submit deidentified data to UPLOADS on a periodic basis • UPLOADS software is password protected
Data completeness	• Mandatory fields are used to specify the minimum requirement for an incident report
Sensitivity	• Data submitted to the nationwide database in deidentified format, to discourage "deletion" of sensitive cases • Incident severity scale to clearly specify the types of incidents to be reported
Availability	• Material provided to train all staff within the organisation on how to report an incident
Specificity	• Incident severity scale to clearly specify the types of incidents to be reported • Cases in the nationwide database reviewed by researchers to ensure they meet the criteria for an incident or near miss

Overall, the survey was useful in highlighting the strategies that would be most influential for encouraging participation in the project, and identifying some potential barriers to participation. The implementation strategies identified in this paper will contribute to the development of the UPLOADS prototype.

References

Auer, A., Dobmeier, T., Haglund, B., & Tillgren, P. (2011). The relevance of WHO injury surveillance guidelines for evaluation: learning from the aboriginal community-centered injury surveillance system (ACCISS) and two institution-based systems. *BMC Public Health, 11*(1), 744.

Barach, P., & Small, S. D. (2000). Reporting and preventing medical mishaps: lessons from non-medical near miss reporting systems. *BMJ, 320*(7237), 759-763.

Bentley, T. A., & Page, S. J. (2008). A decade of injury monitoring in the New Zealand adventure tourism sector: A summary risk analysis. *Tourism Management, 29*(5), 857-869.

Bentley, T. A., Page, S. J., & Macky, K. A. (2007). Adventure tourism and adventure sports injury: The New Zealand experience. *Applied Ergonomics, 38*(6), 791-796.

Brackenberg, M. (1999). Learning from our mistakes–before it's too late. *Australian Journal of Outdoor Education*, 3, 27 - 33.

Brookes, A. (2003). Outdoor education fatalities in Australia 1960-2002. Part 1. Summary of incidents and introduction to fatality analysis. *Australian Journal of Outdoor Education, 7*(2), 20-35.

Brookes, A. (2007). Research update: Outdoor education fatalities in Australia. *Australian Journal of Outdoor Education, 11*(1), 3-9.

Brookes, A. (2011). Research update 2010: Outdoor education fatalities in Australia. *Australian Journal of Outdoor Education, 15*(1), 35-55.

Brown, M., & Fraser, D. (2009). Re-evaluating risk and exploring educational alternatives. *Journal of Adventure Education & Outdoor Learning, 9*(1), 61-77.

Capps, K. (2007). *Factors related to the occurrence of incidents in adventure recreation programs* (Unpublished Masters Thesis). North Carolina State University, U.S.A..

Cessford, G. (2009). *National incident database report 2007-2008: Outdoor education and recreation.* New Zealand: New Zealand Mountain Safety Council.

Cessford, G. (2010). *National incident database report 2009: Outdoor education and recreation.* New Zealand: New Zealand Mountain Safety Council.

Davidson, G. (2004). Fact or folklore? Exploring "myths" about outdoor education accidents: some evidence from New Zealand. *Journal of Adventure Education & Outdoor Learning*, 4, 13-37.

Dickson, T. J. (2012a). Learning from injury surveillance and incident analysis. In T. J. Dickson & T. Gray (Eds.), *Risk Management in the Outdoors: A Whole-of-Organisation Approach for Education, Sport and Recreation* (pp. 204-230). Cambridge University Press: Cambridge, GB.

Dickson, T. J. (2012b). The real physical risks: putting it into perspective. In T. J. Dickson & T. Gray (Eds.), *Risk Management in the Outdoors: A Whole-of-Organisation Approach for Education, Sport and Recreation* (pp. 91-115). Cambridge University Press: Cambridge, GB.

Donaldson, A., & Finch, C. F. (2011). Identifying context-specific competencies required by community Australian Football sports trainers. *BJSM, 46*(10), 759-765.

Drewe, J. A., Hoinville, L. J., Cook, A. J., Floyd, T., & Stark, K. D. (2012). Evaluation of animal and public health surveillance systems: a systematic review. *Epidemiol Infect, 140*(4), 575-590.

Finch, C. F., & Boufous, S. (2008). Do inadequacies in ICD-10-AM activity coded data lead to underestimates of the population frequency of sports/leisure injuries? *Injury Prevention, 14*(3), 202-204.

German, R. R., Lee, L. M., Horan, J. M., Milstein, R. L., Pertowski, C. A., & Waller, M. N. (2001). Guidelines Working Group Centers for Disease Control and Prevention (CDC). Updated guidelines for evaluating public health surveillance systems: recommendations from the Guidelines Working Group. *MMWR Recommendations and Reports* (Vol. 50(RR-13), pp. 1-35).

Haddock, C. (1999). *High potential incidents - Determining their significance: Tools for our trade and a tale or two.* Paper presented at the Proceedings of the 1999 Wilderness Risk Managers Conference, Lander, WY: The National Outdoor Leadership School.

Haddock, C. (2008). Incident Reviews: aspects of good practice. *Ki Waho - Into the Outdoors, 2*.

Hasson, F., Keeney, S., & McKenna, H. (2000). Research guidelines for the Delphi survey technique. *Journal of Advanced Nursing, 32*(4), 1008-1015.

Hill, A. (2011). *National Incident Database Report 2010: Outdoor education and recreation*. New Zealand: New Zealand Mountain Safety Council.

Hogan, R. (2002). The crux of risk management in outdoor programs--minimising the possibility of death and disabling injury. *Australian Journal of Outdoor Education, 6*(2), 71-76.

Holder, Y., Peden, M., Krug, E., Lund, J., Gururaj, G., & Kobusingye, O. C. (2001). *Injury Surveillance Guidelines*. Geneva: World Health Organization.

Keeney, S., Hasson, F., & McKenna, H. (2006). Consulting the oracle: ten lessons from using the Delphi technique in nursing research. *Journal of Advanced Nursing, 53*(2), 205-212.

Klaucke, D., Buehler, J., Thacker, S., Parrish, R., Trowbridge, F., & Berkelman, R. (1988). Guidelines for evaluating surveillance systems. *Morbidity & Mortality Weekly Report CDC Surveillance Summaries*, 37, 1-18.

Leape, L. L. (2002). Reporting of adverse events. *New England Journal of Medicine, 347*, 1633-1638.

Leemon, D. (2002). *Adventure program risk management report III* (D. Leemon and K. Merrill Eds.). U.S.: Association for Experiential Education.

Leemon, D., & Schimelpfenig, T. (2003). Wilderness injury, illness, and evacuation: National Outdoor Leadership School's incident profiles, 1999-2002. *Wilderness & Environmental Medicine, 14*(3), 174-182.

Linstone, A. H., & Turoff, M. (1975). *The Delphi Methods: Techniques and applications*. Reading, Massachussetts: Addison-Wesley.

Merrill, K., & Wright, K. (2001). *Conducting Internal Incident Reviews A process for developing wilderness incident case studies.* Paper presented at the 2001 Wilderness Risk Managament Conference. Retrieved from http://www.nols.edu/nolspro/pdf/ConductingInternalIncidentReviews.pdf

Mitchell, R., Boufous, S., & Finch, C. F. (2008). *Trends in sport/leisure injury hospitalisations (2003-2005) and the prevalence of non-hospitalised injuries (2005).* Sydney, Australia: NSW Injury Risk Management Research Centre, University of New South Wales.

Mitchell, R., Williamson, A., & O'Connor, R. (2009). The development of an evaluation framework for injury surveillance systems. *BMC Public Health, 9*(1): 260.

Priest, S., & Baillie, R. (1987). Justifying the Risk to Others: The Real Razor's Edge. *Journal of Experiential Education, 10*, 16-22.

Rasmussen, J. (1997). Risk management in a dynamic society: A modelling problem. *Safety Science, 27*(2/3), 183-213.

Salmon, P., Williamson, A., Lenne, M., Mitsopoulos-Rubens, E., & Rudin-Brown, C. M. (2009). *The role of Human Factors in led outdoor activity incidents: Literature review and exploratory analysis*. Australia: Monash University Accident Research Centre.

Thomas, M. J. W., Schultz, T. J., Hannaford, N., & Runciman, W. B. (2011). Mapping the limits of safety reporting systems in health care – what lessons can we actually learn? *Medical Journal of Australia, 194*(12), 635-639.

WHO World Alliance for Patient Safety (2005). *WHO Draft guidelines for adverse reporting and learning systems. From Information to Action.* Retrieved from http://www.who.int/patientsafety/events/05/Reporting_Guidelines.pdf

Acknowledgements

This projected was supported by funding from the Australia Research Council (ARC) in partnership with the Australian Camps Association, Outdoor Educators' Association of South Australia, United Church Camping, Outdoors Victoria, Outdoor Council of Australia, Recreation South Australia, Outdoor Recreation Industry Council, Outdoors WA, YMCA, The Outdoor Education Group, Girl Guides Australia, Queensland Outdoor Recreation Federation, Christian Venues Association, Parks Victoria, Victoria Department of Planning and Community Development, Outdoor Education Australia and the Queensland Department of National Parks, Recreation, Sport and Racing. Caroline Finch was supported by a NHMRC Principal Research Fellowship (ID: 565900). The Australian Centre for Research into Injury in Sport and its Prevention (ACRISP) is one of the International Research Centres for Prevention of Injury and Protection of Athlete Health supported by the International Olympic Committee (IOC). Paul Salmon's contribution was funded through the NHMRC post-doctoral training fellowship scheme.

About the authors

Dr. Natassia Goode is a Research Fellow with the University of the Sunshine Coast Accident Research Team.

Prof. Caroline Finch is an NHMRC Principal Research Fellow and the Director of the Australian Centre for Research into Injury in Sport and its Prevention (ACRISP) at Federation University Australia

Ms. Erin Cassell was formerly the Director of the Victorian Injury Surveillance Unit (VISU) at Monash University, now retired.

Prof. Mike Lenné is an Associate Director of the Monash University Accident Research Centre and leader of the human factors research team.

A/Prof. Paul Salmon is the leader of the University of the Sunshine Coast Accident Research Team.

Email: Dr Natassia Goode ngoode@usc.edu.au