UMEÅ UNIVERSITY

# Surviving a Major Bus Crash

## Experiences from the Crash and Five Years after

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*To Michael, Ethan, and Anton*

I'm beginning to realize that real happiness isn't something large and looming on the horizon ahead, but something small, numerous and already here. The smile of someone you love. A decent breakfast. The warm sunset. Your little joys all lined up in a row.

*– Beau Taplin*

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# Abstract

**Background** Major road traffic crashes (RTCs) can have a significant impact on the survivors, their family, and their friends, as well as on emergency personnel, volunteers, and others involved. However, survivors' perspectives are rare or missing in research on major RTCs in Sweden. A comprehensive understanding of the survivors and their experiences is also lacking. By studying what it is like to survive a major RTC, the care and support provided to survivors can be adapted and improved.

The overall aim is to broaden the understanding of the short- and long-term consequences and experiences of surviving a major bus crash.

**Methods** The contexts are two bus crashes that occurred in Sweden, in February 2007 and December 2014. In total, the participants are 110 out of the 112 survivors, and the data is collected through telephone interviews, official reports, and medical records at one month, three months, and five years after the crashes. Analysis methods include qualitative content analysis, descriptive statistics, thematic analysis, and mixed methods research analysis.

**Results** One month after the crash, most of the survivors were experiencing minor or major physical and/or psychological stress in their everyday lives (Study I). Four main findings were identified regarding their experiences of immediate care (Study II): prehospital discomfort, lack of compassionate care, dissatisfaction with crisis support, and satisfactory initial care and support. The importance of compassion and being close to others was also highlighted. Five years after the bus crash in Rasbo (Study III), survivors were still struggling with physical injuries and mental problems. Other long-term consequences were a lasting sense of connectedness among fellow passengers, a gratitude for life, as well as feelings of distress in traffic, especially in regard to buses. The main findings from study IV indicated that injury severity did not seem to affect mental health, and that social aspects were important to the recovery process. There was an interconnection among survivors in which they seemed to be linked to each other's recovery.

**Conclusion** A strong need for short- and long-term social and psychological support in terms of compassion and community is evident in all the studies. The survivors ought to be acknowledged as capable and having the resources to contribute to their own and their fellow survivors' recovery and health. There is a need for greater understanding of how different the survivors are, with each one of them having various physical, psychological, social, and existential needs.

# Abbreviations

AIS = Abbreviated Injury Scale

ED = Emergency department

MAIS = Maximum Abbreviated Injury Scale

NBHW = The National Board of Health and Welfare

PCC = Person-centered care

PFA = Psychological First Aid

PTG = Post-traumatic growth

PTSD = Post-traumatic stress disorder

PTS = Post-traumatic stress

RTC = Road traffic crash

SAIA = Swedish Accident Investigation Authority

SOC = Sense of Coherence

TSQ = Trauma Screening Questionnaire

WHO = World Health Organization

# Svensk sammanfattning

**Bakgrund** Stora trafikskadehändelser kan ha en betydande inverkan på de överlevande och deras närståendes liv, likaså på sjukvårdspersonal, vittnen, och andra som är involverade. Trots detta så är de överlevandes perspektiv sällsynta eller saknas i forskning om stora trafikskadehändelser i Sverige. Det saknas även en helhetsförståelse av överlevande och deras erfarenheter. Genom att studera hur det är att överleva en busskrasch kan omhändertagande och stöd anpassas och förbättras.

Det övergripande syftet är att öka förståelsen av kort- och långsiktiga konsekvenser och erfarenheter av att överleva en stor busskrasch.

**Metod** Kontexten är två busskrascher som inträffade i februari 2007 och december 2014 i Sverige. Antal deltagare är 110 av 112 överlevande och data samlades in en månad, tre månader och fem år efter krascherna, via telefonintervjuer, officiella rapporter och medicinska journaler. Analysmetoder inkluderar kvalitativ innehållsanalys, deskriptiv statistik, tematisk analys och mixad metod.

**Resultat** En månad efter kraschen upplevde överlevande fysiskt obehag och/eller psykisk stress i varierande grad i sin vardag (Studie I). Gällande upplevelser av det initiala omhändertagandet (Studie II) identifierades fyra huvudresultat; obehag på skadeplats, brister i omhändertagande och bemötande, missnöje med krisstöd, och tillfredsställande initialt omhändertagande och stöd. Betydelsen av empati och medkänsla från personal och frivilliga samt samhörighet med medpassagerare lyftes fram av de överlevande. Fem år efter busskraschen i Rasbo (Studie III) fanns det överlevande som fortfarande kämpade med fysiska skador och psykiska problem. Andra tydliga långsiktiga konsekvenser var en bestående gemenskap mellan medpassagerare, en tacksamhet över livet, samt oro och rädsla i trafiken, speciellt vid bussåkande. Uppföljningen efter busskraschen i Tranemo (Studie IV) indikerade att sociala aspekter var betydelsefulla för återhämtningsprocessen hos överlevande och att skadornas svårighetsgrad inte var betydande för det psykiska välbefinnandet. En stark samhörighet upplevdes bland de närstående som reste tillsammans och de verkade följa varandras återhämtning.

**Slutsatser** Ett starkt behov av kort- och långsiktigt socialt och psykologiskt stöd i form av gemenskap och empati är tydligt i samtliga studier. De överlevande bör uppmärksammas som aktörer med kapacitet och resurser till att bidra till sin egen och medpassagerares återhämtning och hälsa. Det behövs en ökad förståelse för hur olika de överlevande är, med varierande fysiska, psykologiska, sociala, och existentiella behov.

# List of publications

This dissertation is based on the following studies, which will be referred to in the text by their Roman numerals:

I.      Doohan, I., Saveman, B-I. Impact on life after a major bus crash – a qualitative study of survivors' experiences. Scandinavian Journal of Caring Sciences. 2014; 28: 155-163

II.     Doohan, I., Saveman, B-I. Need for compassion in prehospital and emergency care: A qualitative study on bus crash survivors' experiences. International Emergency Nursing. 2015; 23(2): 115-119

III.    Doohan, I., Gyllencreutz, L., Björnstig, U., Saveman, B-I. Survivors' experiences of consequences and recovery five years after a major bus crash (submitted 2017)

IV.    Doohan, I., Björnstig, U., Östlund, U., Saveman, B-I. Exploring injury panorama, consequences, and recovery among bus crash survivors: A mixed methods research study. Prehospital and Disaster Medicine. 2017; 32 (2): 165–174

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# Introduction

In the early morning of April 2, 2017, a double-decker bus went off the road close to Sveg in Härjedalen, Sweden. On the bus were 52 fourteen-year-old students, six adults, and one driver, all of whom were on their way to a ski resort. The bus went off the road at high speed (100 km/h) and overturned, with the right side facing down next to the road. Tragically, 30-40 persons were injured, out of which three students were fatally injured (1). The crash occurred in a rural area 150 kilometers from the closest hospital. Fortunately, it was only 20 kilometers to the nearest health care center. This major incident demanded interaction among organizations, structure, and some improvisation. The incident was handled well based on the circumstances, partly because of the quick prioritizing of injured persons and the health care center being staffed and prepared. A majority of the survivors were first transported to a parish house in Sveg, and the injured persons were subsequently transported to the local health care center. The disaster plan for the health care center stated that they could normally manage five persons during standby hours, but on that morning, they treated more than six times as many persons. They managed to cope with the situation, as they were able to quickly mobilize extra personnel (1, 2).

Tragic road traffic crashes (RTCs), like this one, occur on a regular basis. We can all relate to them since most of us travel by car, bus, or train each day, and many of us personally know someone who has been injured or lost someone in a traffic crash. I have spent the last few years studying how and in what ways a person is affected by surviving a major RTC, and more specifically, a bus crash. The consequences for survivors after these major incidents are relatively unexplored, even though the outcome for survivors after such events seems to be similar to the individual consequences after major disasters.

My starting point was to explore the phenomenon of surviving a bus crash by studying the survivors from a broad perspective. With an interdisciplinary background, my ambition has been to try to include the central health and unhealth dimensions of a person's life, to consider them equally important, and to study them in the context of a traumatic life event. The first dimension to address is the immediately visible one: physical health. The second dimension to address is the more subtle and unseen one: psychological health. That is, all the things that happen in our minds when we are exposed to extremely stressful experiences, and how this is influenced by biology, external actions, and personality. I have chosen to call the third dimension existential health, which plays a role in linking the previous two together. Existential health covers the

subtler aspects in a person's life, such as thoughts about social relationships and the purpose of life.

It is necessary to achieve in-depth knowledge and understanding of these dimensions one by one, but it is of the outmost importance to also connect all of them to try to reach a wider understanding of survivors and of aspects affecting their health. To do this requires an all-encompassing approach, which has been my focus throughout the dissertation work. Therefore, I have chosen to adopt a theoretical perspective stemming from the Nordic tradition of caring science, in which the human being is seen as an integrated entity, comprised of physical, psychological, and existential dimensions (3). A survivor's health therefore encompasses all of these dimensions and concerns all parts of a person's life. The definition of health that is used in the dissertation is "to feel well and being able to do what you consider to be of value in life, both big and small" (4). Within the Nordic tradition of caring science, it is essential to support and enhance the health processes of the affected person and to place that person in the center, viewing his or her illnesses as contexts (3). This is the essence of person-centered care (PCC): to become aware of the perspective of the person in need and to offer care that focuses on the individual's own needs, preferences, and values (5). An affected person also needs to be considered in connection to his or her immediate context, that is, the family and other persons of significance. The family can be seen as a system in which everyone is connected, and when something happens to a member of the family, it will certainly affect the other family members (6).

In this dissertation, I have explored what it is like to survive a bus crash, based on the survivors' own experiences. The dissertation covers two cases of major bus crashes that have occurred in Sweden. The focus will be on experiences of individual (physical, psychological, and existential) health consequences, overall care and support, and the recovery process from the day of the crash up to five years after. Bus crashes and other major RTCs will continue to happen in Sweden on a regular basis. My ambition with this dissertation is to contribute with transferable knowledge and an empirical understanding of bus crash survivors so that their needs may be met.

## Background

### Disasters

This dissertation has its place within the disaster research area. Disaster research covers a broad spectrum of events that can turn into disasters: natural, human-made, economic, and mixed events (7). Disaster research is a rapidly emerging interdisciplinary field (8), and the ultimate goals of conducting disaster research are to obtain information to decrease risks that a hazard will produce a disaster, decrease the rates of mortality and morbidity associated with disasters, and enhance recovery of the affected community (7).

Internationally, a disaster occurs when the needs after an event cannot be met with the local response capacity, and outside resources and responses are required to help meet the needs of the affected community (7). In Sweden, a disaster could be "any situation where available resources are insufficient in relation to immediate care needs" (9). Major disasters do not occur frequently in Sweden, but major incidents occur on a regular basis (10). When they occur, the consequences can be overwhelming for the survivors and the community.

The latest major disaster to affect Sweden was the Southeast Asia tsunami disaster in 2004, in which more than 227,000 persons perished (11). There were about 7,000 Swedish tourists traveling in the affected area at that time, and it is estimated that the disaster caused the death of 543 of them (12). Disasters of this scale demand a lot of resources that have to be sustained over a long period of time.

### Road traffic crashes

When it comes to RTCs worldwide, it is estimated that about 1.3 million people die each year because of them, and 20-50 million people suffer nonfatal injuries. For people between 15-29 years old, RTCs are the leading cause of death, and nearly half of all road traffic deaths are among vulnerable road users: pedestrians, cyclists, and motorcyclists (13, 14). Comprehensive statistics on major RTCs or other transportation disasters worldwide are difficult to obtain, partly due to the sector not being as regulated as the air, sea, and rail sectors, and partly due to countries having immature systems for collecting road injury data (15).

In Sweden, a high number of people use public transport, and in 2015, there were nearly 1.5 billion individual travels using public transport (bus, boat, transportation service). Bus is the most common means of public transportation

in Sweden, and in 2015 there were over 775 million individual travels specifically on public buses (16). Sweden is considered one of the safest countries in the European Union, with low numbers of persons killed in traffic per capita. In 2014, according to the latest statistics on road traffic injuries, there were 8.102 persons in Sweden who were hospitalized for at least one day due to road traffic injuries (17). In 2016, the Swedish police reported that 270 persons were killed in traffic, which comes out to 2.7 persons killed per 100 000 inhabitants. For the past four years, the number of deaths in road traffic has been around 260-270 persons per year, and it has been rare to see more than two fatalities in a crash (18).

## Major bus crashes in Sweden

During the period of 1997 to 2017 there were several major bus crashes in Sweden with many affected (see Table 1) (10).

Single bus crashes in Sweden often involve intercity and tour buses, and the crashes usually occur in rural areas during winter and under windy conditions. A bus crash can be difficult to manage for prehospital personnel, as they are faced with numerous injured passengers that can be piled up on top of each other in a confined space. The number of passengers being thrown out of their seats varies depending on seatbelt usage. Two fatal-injury mechanisms are passengers being ejected through the windows and being crushed under the bus as it rolls over and passengers being crushed between the roof and the back of the seat if the bus overturns and the roof collapses. Bus crashes often require rapid responses and proper equipment to be able to extricate passengers (15).

Table 1: Major bus crashes in Sweden during 1997-2007 (10) and 2008-2017 (unpublished data).

| Date and location | Description of the bus crash |
| --- | --- |
| **February 1997, Knivsta** | Frontal collision between two buses: 25 affected passengers |
| **November 1998, Sala** | Single crash and fire: 50 affected |
| **September 2001, Indal** | Collision between school bus and timber truck: 42 affected, including six fatalities. Many school children involved |
| **November 2001, Robertsfors** | Single crash: 34 affected |
| **February 2002, Mantorp** | Single crash: 45 affected, including one fatality |
| **June 2002, Råneå** | Collision between two buses: 17 affected, including two fatalities. Many school children involved |
| **January 2003, Fagersta** | Single crash: 49 affected, including six fatalities |
| **January 2006, Arboga** | Single crash: 51 affected, including nine fatalities |
| **February 2007, Rasbo-Uppsala**\*\* | Collision between two buses: 62 affected, including six fatalities |
| **May 2010, Stockholm**\* | Single crash: 30 affected, including one fatality |
| **December 2011, Mullsjö**\* | Collision between bus and truck: 20 affected, including two fatalities |
| **December 2014, Tranemo**\*\* | Single crash: 58 affected, including two fatalities |
| **April 2017, Sveg**\* | Single crash: 58 affected, including three fatalities. Many school children involved |

*Compiled and added by author, ** Reported in dissertation

## Individual consequences after a bus crash

In this section, examples of individual consequences after a major RTC will be presented in chronological order, with an immediate, intermediate, and long-term phase. The immediate phase implies the day of the crash, the intermediate phase indicates the time after the crash and up to one year after (<1 year). The

long-term phase refers to one year after the crash and onward (>1 year). Under each phase, the physical, psychological, social, and existential consequences will be presented. It is worth noting that the consequences for survivors can differ and change over time, making it difficult to specify the length of these time phases. The time frames presented are therefore only approximate.

Literature on both disaster and RTC survivors will be presented, as their results can be relatable to major RTCs. Focus will be placed on the aspects more central to the studies included in the dissertation. For example, physical injuries and actions taken to mitigate them will not be presented in depth.

## *Immediate phase (the day of the crash)*

The cause of a bus crash and the scenario that arises afterward can both vary greatly. First of all, the injury panorama after a bus crash is dependent on the type of crash. For single crashes, the bus often steers off the road (for various reasons), rotates 90 degrees to the right side, and comes to a stop in a ditch or the roadside area. This exposes passengers on the right side of the bus to the highest risk of fatal crushing injuries, by ejection through a window. Typically, the most severely injured passengers are those sitting on the right side, especially in the front of the bus. A study by Albertsson et al. (19) indicated that more than half of those injured in three single bus crashes sustained non-minor injuries (MAIS ≥2) and one in five suffered serious or more severe injuries (MAIS ≥3). One-third of all injuries were to the head, 27% were to the upper extremities, and one-fourth was to the chest or abdomen (19). The most severely injured passengers in bus collisions are the ones who are exposed to intruding structures or vehicles. Minor injuries are caused by, for example, crushed glass splinters or flying objects. Abrupt decelerations, as in a frontal collision, can cause head injuries by means of the passenger hitting the back of the seat in front of them (reverse whip lash injuries by neck extension) (10).

When the bus comes to a stop, survivors react in various ways. When experiencing a traumatic and threatening situation, the most common reactions are fight, flight, and freeze or submissive reactions (20). As research have developed, a fourth reaction called "tend and befriend" has been added to the initial reactions (21). All the reactions are adaptive and based on the specific person's background, biology, previous experiences, and the severity of the situation. The survivors' initial expressions of stress and fear are considered normal and natural reactions following a traumatic major incident (22).

Usually, oncoming bystanders arrive immediately afterward and start to help before emergency personnel arrives (9). For example, in the Sveg bus crash that occurred in Sweden on April 2, 2017, the teachers on the bus provided a

valuable initial response by evacuating all children, except the fatally injured ones, out of the bus before professional help arrived (2).

Unfortunately, descriptions in research literature on the experiences, the interaction, and the events taking place among the survivors in the immediate phase after a major RTC are very limited.

## *Intermediate phase (<1 year after)*

For survivors, the following days, weeks, and months after the crash are characterized by physical and psychological rehabilitation and recovery. During the first couple of weeks and months after an RTC, the survivors may experience a lack of physical and mental health and problems related to one's social life (23).

In relation to the psychological aspects and mental health, the term "potentially traumatic events" will be used, since it is the person's interpretation and perception of the situation and his or her own ability to handle it that determines if the event is experienced as traumatic or not. For example, how a survivor experiences and processes a RTC is more important in predicting the development of post-traumatic stress disorder (PTSD) than what objectively happens to the survivor (24). However, in the dissertation overall, the term "a traumatic incident/event" is used and refers to an event that includes physical trauma, such as a traffic crash.

Negative psychological consequences that remain or are present for some time can often be disruptive and cause a delayed recovery (25, 26). Experiencing a traumatic major incident can lead to a variety of mental health problems, including acute stress disorder, PTSD, depression, anxiety, separation anxiety, incident-specific fears, phobias, somatization, traumatic grief, and sleep disturbances (27). PTSD is probably the most commonly studied post-disaster psychiatric disorder (28). In a follow-up study on survivors one year after experiencing an RTC, the survivors were identified in five groups: one large group (33%) of survivors with few lasting problems, one group with mostly physical consequences, a third group with both physical and social sequelae, and two groups with a wider range of problems. The results indicated that persons from lower socioeconomic backgrounds, with or without lower limb injuries, had many difficulties returning to work and would have benefitted from specific support (29). The results illustrate the variety of long-term needs among survivors. Another study on 72 RTC survivors who were followed-up at three, six, and 12 months pointed out that the survivors suffered from psychological trauma symptoms even though most of them were not seriously injured (30). Personal experiences and coping styles were important variables in

the study and highlighted the value of understanding the subjective meaning of the RTC for the survivors. Further research on survivors' specific experiences and their subsequent health is needed.

Other intermediate consequences are the effects on family members and family life overall. Surviving an RTC can lead to considerable changes within families and affect relationships. For example, associated unexpected and unplanned loss of income can cause stress, create an imbalance in the household, and bring along a sense of uncertainty about the future (31). The effects on family and significant others after major incidents are still relatively unexplored.

## *Long-term phase (>1 year after)*

The long-term experiences for survivors are rarely documented in disaster specific literature, where the focus is generally on the immediate response and short-term consequences. Comprehensive research on physical and psychological long-term consequences is still scarce.

The rate and pattern of returning to work is an area that has been studied in research on RTC survivors. Injury type and severity, and occupation, are presented as factors that have a considerable influence on when and how survivors return to work following RTC injuries (32). In another study on the ability to return to work, it was found that, at an early stage, two variables could accurately identify 75% of persons who will not return to work by two years after the RTC: disability level and expectations about going back to work (33).

Studies within disaster psychology mainly focus on longitudinal aspects and trajectories of mental health. There are long-term studies on the recovery of Swedish disaster survivors, often concentrated on post-traumatic stress (PTS). Among them are the Gottröra Airliner Emergency landing in 1991 (34), the MS Estonia ferry disaster in 1994 (35), and the Southeast Asia tsunami disaster in 2004 (36, 37). In another longitudinal study on survivors after the tsunami disaster, it was concluded that physical injury was associated with higher levels of PTS reactions and worse mental health at 14 and 36 months after the disaster (38). Fifteen years after the MS Estonia ferry disaster, it was emphasized that survivors still had a prolonged need for social support from significant others and those with similar experiences (39). Further, it was concluded that PTS among these survivors declined between three months to one year, but there were only minor changes between one to 14 years. It has been noted that RTC survivors with serious orthopedic injuries have experienced major psychological distress and a range of other psychosocial consequences four years after their RTC (40). These results indicate a need to conduct long-term follow-ups among survivors of major RTCs as well.

Fortunately, most people recover from traumatic events without severe mental health consequences (25). One of the reasons for this is resilience. Resilience is usually conceptualized as a person's ability to cope with a potentially traumatic event and can broadly be defined as "the capacity to recover and return to healthy, symptom-free functioning after a potentially traumatic event" (41). The typical longitudinal outcome patterns after traumatic events are chronic distress, gradual recovery, delayed increase in distress, and resilience. Resilience is typically the pattern most commonly observed, and there are multiple, independent predictors of resilient outcomes, e.g., personality, demographic variation, trauma exposure level, social and economic resources, existing world views, and capacity for positive emotions. Many of these resilience predictors are relatively stable, which means that they either cannot be changed or are not easily changed (42). It is suggested that resilience following traumatic events may be more prevalent than previously believed (41).

Another possible outcome of surviving a disaster or major incident is post-traumatic growth (PTG). Some survivors show signs of becoming mentally stronger and more self-confident after surviving a potentially traumatic event, which is defined as signs of PTG. They are able to appreciate their lives more than before, and surviving a traumatic incident helps to crystallize the value of life. It is highlighted that survivors become aware of the significance and grace of life, recognize the spiritual aspects of life, and appreciate contact with others (43). Achieving PTG does not mean that psychological distress is absent, but the survivors' perceptions of positive changes may indicate positive mental health among the survivors (44).

## Actions and interventions after a bus crash

The actions and interventions that are taken to minimize or mitigate consequences for survivors after a major RTC are presented in the section below. The time phases are the same as above: immediate, intermediate, and long term. The specific length of these phases is not set, as the survivors' needs will differ and change over time.

### *Immediate phase*

When emergency personnel (rescue services, ambulance personnel, and police) arrive, the main priority is to provide security and save lives. After for example a bus crash, evacuation of the bus is one of the first steps. After and during evacuation, screening and sorting models are used to determine in what order survivors are to be treated and transported. For injured survivors, basic medical measures are taken to be able to bring the them to a hospital with the least risk of deterioration and increased suffering, e.g., creating a free airway, preventing

external bleeding and cold exposure, temporarily immobilizing severe fractures, and if necessary, relieving pain. One of the inherent tasks for emergency personnel is also to provide psychological support and to ensure that the medical activity on-site is characterized by empathy and compassion (9). Depending on where the crash has occurred and what resources are available, survivors will eventually be transported by ambulance, bus, or helicopter to a health care center, a gathering place, or a hospital.

Today, offering psychological and social support to survivors is essentially about strengthening and complementing the inherent resilience of a person. The basis for immediate psychological support is the natural social network that, in most cases, exists around a person. Psychological and social support from people close to an affected person is a well-known factor for promoting health throughout one's recovery (45). The organized psychological support that is offered immediately after a major incident differs depending on the number of affected persons and the resources available. At hospitals in Sweden, there are usually crisis management teams designated to organize and manage psychological and psychiatric support for patients, relatives, and personnel after a serious event. At health care centers or other gathering places, there may be volunteers and members from nonprofit organizations that provide emergency crisis support. In Sweden, every municipality is obliged to have a crisis support group. These groups are called a "POSOM" group, which stands for "psychological and social support and care," and they are a part of a national nonprofit organization. All those who are involved in POSOM groups do it on a volunteer basis, and the organization manages around 350 crisis events per year. After major incidents or crises, the POSOM group can be activated quickly and offer support, such as psychological first aid, to those affected (46).

There are five widely acknowledged, evidence-informed intervention principles regarding immediate and intermediate psychological support after major trauma (47). These guiding principles aim at supporting and promoting a person's natural recovery, and the principles can be adapted to fit a specific time frame, situation, organization, or culture. The first principle is to promote a sense of safety, such as reducing the bodily aspects of PTS, since the ongoing threat can worsen cognitive processes that hinder recovery. The second principle is calming, and it aims at helping a person to not stay in a prolonged state of heightened emotional response. The third principle is to promote a sense of self- and community-efficacy, which is about promoting a sense that oneself or one's community can cope with and recover from traumatic experiences. Connectedness, in the form of social support and being connected to significant others, is the fourth principle and has been related to better emotional well-being and recovery. The last principle, instilling hope, implies

the importance of helping a survivor to feel confident that a positive future outcome is possible (47). These five principles lay the groundwork for "psychological first aid," which aims at reducing the immediate effects of traumatic events and supporting adaptive aspects in the short and long term (48). It includes a variety of practical guidelines, e.g., establish a compassionate contact, provide physical and emotional safety, calm distressed and overwhelmed persons, ask how to help with immediate needs and offer practical help, communicate information, help persons to get in touch with significant others, and provide contact with further help and support (48).

Current evidence suggests that, in regard to psychological interventions, practical, pragmatic support provided in an empathic manner is the appropriate initial response (49). This can be provided by fellow survivors, family, personnel, and volunteers. Apart from emergency personnel, it is unclear how widespread the knowledge is regarding psychological first aid.

## *Intermediate phase*

Social support continues to be of great importance during the weeks and months following a major incident. To lack vital social support is considered a risk factor for mental illness. Strikingly, in the area of RTCs, there are hardly any studies on the role of significant others and the care of which they provide (23).

Fourteen months after the tsunami disaster, satisfaction and dissatisfaction with support among 1,505 survivors was investigated (50). It was found that receiving organized psychological support after the tsunami was associated with psychological distress and PTS 14 months after the event. Positive health consequences are recognized for survivors who encounter support and experience it as satisfying, but survivors' opinions of formal interventions still need to be investigated in relation to subsequent long-term health (50). Finally, it was concluded that there is a need to use qualitative methods to further study the interaction between helpers and survivors and the role of social and formalized support. In another study of severely injured RTC survivors, it was emphasized how important it is to screen and treat for psychological comorbidities in a timely manner. Also, the importance of striving toward a comprehensive and holistic understanding of the impact of injury on a person was highlighted (51).

Since the survivors' need for mental health is not nearly as visible as their highly observable physical needs, it is particularly important to monitor their mental health needs over the following weeks and months after an incident. In order to continuously monitor various needs and deliver beneficial care to survivors, it is

essential for the medical health care system and community health services to cooperate and communicate properly (52). In a follow-up study on 507 RTC survivors one to three years after the incident, the results showed that psychiatric outcomes and pain were not related to severity of injury. Symptoms of a mental disorder were reported for 26% of the survivors, and 21% reported moderate to severe pain three years after the crash. Despite a majority (76%) having only minor injuries, such as bruises and lacerations, the long-term consequences were challenging (53).

## *Long-term phase*

There is a lack of literature on survivors' long-term rehabilitation and recovery after surviving a major RTC, as well as intermediate and long-term follow-up and evaluation of support interventions. Existing literature on the long-term phase is mainly concentrated on psychological interventions and aspects. In a long-term perspective, the main source of care and support usually comes from one's natural social network consisting of family, significant others, friends, neighbors, and coworkers (54). The intermediate and long-term significance of these close relationships for survivors has been highlighted, e.g., in a study on Swedish tourists affected by the tsunami disaster (55). The study showed that compassionate relationships and encounters with other people helped survivors to discover a new understanding of life and supported their progress in existential health. Based on further research on and in communion with the tsunami survivors, a model on long-term care after disasters was developed (56). It stated that long-term care after a major incident or disaster involves existential issues and reflections: existential questioning of the meaning of life, its content, values, and priorities; relationships with others; and the importance of health, suffering, love, and death. Initially, physical and psychological stress may have been the main concern for an injured survivor, but over time, this could change and become "an existential wound". Existential care based on compassion can aid the survivors through this long-term recovery process (56).

However, little is still known about the long-term phase after an RTC, whether it is a minor or major RTC. Knowledge is scarce, especially regarding the psychological, social, and economic burden after RTCs (23), as well as information on the importance of social relations in an intermediate and long-term perspective. Further empirical research is needed in the area of psychological and social care and support (9), and existential support.

## Rationale

Major RTCs happen frequently around the world and on a yearly basis in Sweden, and these events can have devastating consequences for both individuals and the community.

Studies on survivors from major disasters and RTCs have been conducted internationally and nationally. However, information on survivors after the events that by definition fall in between disasters and RTCs, i.e., major RTCs, is scarce. There are evidence-informed guidelines on how to treat and take care of survivors and their families; still, there is a need for empirical data that support them.

Existing research on RTCs are normally one dimensional, with emphasis on the pathological aspects. All survivors are seldom included; instead, mainly those who are referred to medical care or who seek professional help for physical or psychological problems are involved. There is a need to more extensively study the healthy and uninjured survivors, to understand and care for them and their significant others in the best possible way. It is time to further explore the active role of trauma survivors, the interactions among fellow survivors, and survivors' experiences over time. This could broaden the knowledge on individual resilience and health-facilitating aspects.

The overall challenge is that there is no comprehensive perspective of a survivor. To combine the physical, psychological, and existential aspects of a survivor and to see him or her as an "entity" consisting of these dimensions is an approach that has rarely been applied in disaster medicine research. To reach a broader understanding of the complexity of survivors' needs and individual resources, it is necessary to explore their experiences from a multidimensional perspective.

# Aims

## Overall aim

The overall aim is to broaden the understanding of the short- and long-term consequences and experiences of surviving a major bus crash.

## Specific aims

Study I

Aim: to describe and analyze the nonphysical consequences of a fatal bus crash and how it has affected the passengers' lives from a short-term perspective.

Study II

Aim: to explore the survivors' experiences of the prehospital and emergency care after a major bus crash.

Study III

Aim: To explore survivors' experiences of the physical and psychological long-term consequences and experiences of recovery five years after a major bus crash.

Study IV

Aim: to explore the physical and mental consequences and injury mechanisms among bus crash survivors to identify aspects that influence recovery.

# Methods

## Research design

A hermeneutic approach is used to inductively study the phenomenon of surviving a major bus crash. The studies (I-IV) are based on two cases of bus crashes in Sweden. Studies I, II, and III are retrospective case studies with qualitative designs, and study IV has a mixed methods research approach. For details, see Table 1.

Table 1. Overview of studies I-IV

| Study | Content | Design | Setting | Participants | Data collection | Data analysis |
|---|---|---|---|---|---|---|
| I. | Short-term consequences after a major bus crash  (<1 month) | Retrosp-ective case study | Bus crash outside of Rasbo, 2007 | Total popula-tion of bus crash survivors (N=56) | Telephone interviews 2007 | Qualitative content analysis |
| II. | Experiences of prehospital and emergency care  (crash day) | Retrosp-ective case study | Bus crash outside of Rasbo, 2007 | 54 out of 56 bus crash survivors | Telephone interviews 2012 | Qualitative content analysis |
| III. | Long-term follow-up of consequences and recovery  (<5 years) | Retrosp-ective case study | Bus crash outside of Rasbo, 2007 | 54 out of 56 bus crash survivors | Telephone interviews 2012 | Qualitative content analysis |
| IV. | Injury pano-rama, conse-quences and recovery  (<3 months) | Mixed methods research study | Bus crash outside of Tranemo, 2014 | 54 out of 56 bus crash survivors | Telephone interviews 2015  Medical records  Official report | Qualitative thematic analysis  Descriptive statistics  Mixed-methods research analysis |

## Studies I-III: The Rasbo bus crash in 2007

### *Context*

The Rasbo crash is one of the worst bus crashes that have happened in Sweden (10). Two commuter buses going in opposite directions at 90 km/h on a two-lane road outside of Rasbo and Uppsala, Sweden, collided in a small overlap crash (see Figure 1). The road was covered in snow slush, and only one lane had been plowed. Six of the 62 passengers were killed instantly in the crash: five persons on one bus and one person on the other bus. Off-duty emergency personnel on their way to work (two fire officers, one intensive care physician, and one ambulance nurse) were the first ones to arrive at the crash site. Together they initiated an emergency response. The physician took an overview of the medical conditions of the injured, and the ambulance nurse contributed by organizing and preparing the care of the injured. Approximately 20 minutes later, official emergency personnel arrived. Most of the passengers were sent to a nearby gathering place, while a few were transported directly to hospitals by ambulance or helicopter. The rest of the survivors were subsequently sent to three different emergency departments (EDs), and the transport time from the time of the crash to arrival at the EDs varied from 1 to 4.5 hours (57).



Figure 1. The two buses in the Rasbo crash (57).

### *Physical injuries*

Abbreviated Injury Scale (AIS) classification is used to describe injuries as follows: AIS 0, no injury; AIS 1, minor injury (e.g., a superficial laceration or a nose fracture); AIS 2, moderate injury (e.g., a concussion); and AIS 3 to 6, serious, severe, critical, and maximal injuries, respectively. Maximum AIS (MAIS) represents a person's injury with the highest AIS value (58). The deceased passengers suffered from lethal thoracic, skull, and abdominal injuries (AIS 5-6). A handful of passengers who sat in the adjoining area of the impact

zones suffered moderate to serious injuries: three survivors had serious injuries, such as complicated fractures and internal injuries (MAIS 3), and seven survivors had moderate injuries, such as concussion and rib fractures (MAIS 2). The remaining 46 survivors sustained minor injuries, mostly abrasions and minor wounds (MAIS 1). The most commonly injured body parts were the head and the lower extremities. The survivors had a total of 194 injuries, and the most common ones were abrasions and wounds. All data regarding the passengers and their physical injuries were collected from an official report completed by the Swedish Accident and Investigation Authority (SAIA) (57).

## *Participants*

*Study I*
In study I the participants constituted the total population of the 56 surviving passengers (24 women and 32 men) from the two buses in the Rasbo crash. Ages ranged from 18 to 64 years, with a mean of 41 years (57). The participants were recruited and contacted by the SAIA in 2007.

*Study II and III*
The sampling was purposive and included all 56 survivors. Fifty-four out of the 56 surviving passengers—21 women and 33 men—constituted the sample. Two survivors, one man and one woman, were unreachable and were consequently excluded from the study. These two survivors had sustained mild and moderate injuries, respectively. At the time of the interviews, the participants were 23 to 69 years old with a mean age of 43 years (57).

## *Data collection*

*Study I*
Data collection was conducted by the SAIA during its investigation of the bus crash in 2007. A professor in traumatology and a registered nurse (RN) with considerable experience in interviewing trauma patients were appointed by SAIA to examine the medical aspects of the crash. They developed an interview guide for this specific purpose that included semi-structured questions, ranging from questions regarding the passengers' experiences to questions on medical care. The RN conducted telephone interviews with the total population of 56 survivors approximately one month after the crash. The interview guide's scientific merit and content followed the traditional knowledge base for consequences after a major crash, and all interviews were conducted in a systematic and consistent manner. Many questions could be answered with a simple yes or no; though in many cases the survivors narrated their experiences

thoroughly. Some examples of questions were, "Are you satisfied with the way you were taken care of?" and "Were you able to help someone else on the bus?" Detailed notes were taken as close to verbatim as possible so that they represented the participants' answers. Interview notes resulted in between one and three pages of text per participant. In 2012, the interview data from the SAIA were made available to the researchers. First, the notes of the interviews were made anonymous to the research group to ensure the participants' confidentiality and then they were supplied to the research group. The interviewer was not part of the research team.

*Studies II and III*
The survivors were contacted again, by letter, five years after the bus crash, and 54 gave verbal informed consent to participate in the follow-up telephone interviews. An interview guide was developed by the research team. The guide included 19 semi-structured questions regarding their experiences of the rescue operation, medical care, and support, e.g., "What is your opinion of the care you were given after the crash?" and "What help or support was the most important to you during the first few days after the crash?" The RN interviewer who had conducted the interviews in 2007 was also recruited for the follow-up interviews. The participants were aware that the interviewer was the same RN to whom they had spoken in 2007. The interviews were anonymized before they were given to the researchers. Interview length varied from eight to 75 minutes. The interviews were audio recorded and transcribed verbatim. The amount of written text per participant ranged from one to 18 pages and totaled 226 pages.

## *Data analyses*
The interview texts in studies I-III were analyzed using qualitative content analysis (59). The following analysis process was similar for all three studies: The texts from the participants were treated equally in the analysis process, and no distinction between the texts from the survivors was made regarding the participants' injuries. Data were inductively analyzed to describe the participants' experiences and perspectives. The material was initially read carefully to achieve an overall understanding of the content. For studies II and III the interviews were also listened to. Note that in studies II and III, data were separated in the analysis phase, since study II focused on the crash-day experiences and study III focused on the long-term experiences.

The unit of analysis in each study was the interview data. Through guidance from the research question, meaning units were distinguished from the unit of analysis—that is, the interview material. Meaning units were then condensed and abstracted into codes, and possible categories were kept in mind. Codes that shared commonalities were sorted into categories and subcategories. The

research group read the text and then analyzed and discussed the evolving categories and subcategories to ensure rigor (59). The analysis process consisted of a back-and-forth movement between the whole text and parts of it.

In studies I and II the analysis focused on the manifest content in the material, the visible and observable components of the text. The manifest content represents what the text states, not necessarily the underlying meanings of it (59). In study III the analysis was also focused on the latent content, which resulted in an overarching theme that represented the underlying thread between the categories and the latent content of the text (59).

## Study IV: The Tranemo bus crash in 2014

### *Context*

A bus with 57 passengers and a driver was traveling from Borås, Sweden, to Copenhagen, Denmark, on December 4, 2014. The crash occurred outside of Tranemo at 7:20 AM, when the driver of the bus suffered a brain hemorrhage and lost control of the bus. The bus went off the road at a high speed (100 km/h), overturned, and hit the trench on its left side (see Figure 2). The glass windows on the left side of the bus were shattered one by one as the bus continued sliding along the rocky terrain for about 50 meters. Broken glass showered over the passengers, and soil, plant material, and stones were thrown with high velocity into the bus through the broken windows. Passengers were hit by large stones up to 40 centimeters in diameter (see Figure 3). On the left side of the bus, the passengers' arms and hands were injured as they were scraped against sharp stones and rocks on the ground. Four persons who had been driving in cars behind the bus stopped at the scene within seconds and started helping passengers. Rescue services, police, and ambulance personnel arrived approximately 15 minutes after the crash. There were 56 passengers and a driver on the bus. One passenger in the back of the bus died within seconds after the crash, and the driver of the bus died later that same day. In total, 49 passengers were injured (60).

Figure 2. The Tranemo crash site. Photo: Robin Aron Olsson



Figure 3. Photo of a seat covered in stones and soil (60).

## *Participants*

The sampling was purposive, and the sample included 54 of the 56 survivors: eight men and 48 women. Their ages ranged from 19 to 96 years old, with a mean of 57 years. The two survivors not included in the study were two women with minor injuries.

Among the participants there were seven passengers with serious or severe injuries (MAIS 3 or 4). Two of them had massive lacerations and crush injuries on their left arms, which were caught between the bus and the ground for more than an hour. Four participants had moderate injuries (MAIS 2), 38 had minor injuries (MAIS 1), and the remaining seven had no physical injuries. The most frequently affected body parts were the upper extremities (39% of all injuries) and the head (32%). The 49 injured survivors had a total of 122 defined injuries, mostly fractures, wounds, and contusions.

## Data collection

### Quantitative data collection

Quantitative data on the survivors' types and severity of injuries were collected from medical records at the three hospitals and two health care centers involved. Complementary data on minor injuries or the absence of injuries were collected from the survivors themselves. Participants' injuries were sorted using the AIS (58).

I conducted the 54 semi-structured telephone interviews with the respondents. At the end of the interviews, quantitative data on perceived mental status were collected with the use of a verbal version of the Trauma Screening Questionnaire (TSQ). The TSQ is a brief screening instrument developed by Brewing et al. (2002) (61). They recommend that it can be used for early identification of persons at risk for PTSD after traumatic experiences. Being able to screen for PTSD is important for example in the context of mass casualty incidents, when survivors are dispersed geographically, or when there is a lack of specialists in psychological trauma (62).

The TSQ consists of 10 self-assessment questions to which the respondents answer "yes" or "no." The questions cover two of the PTSD criteria: re-experiencing and arousal symptoms. If a respondent answers "yes" six times or more, he or she may be at risk of developing PTSD and should consider additional psychological support (61). TSQ has been validated previously (61). Brewing et al. (61) used two separate samples, 41 rail crash survivors and 157 crime victims. Their results showed high levels of sensitivity and specificity in predicting PTSD. Walters et al. (63) carried out a large-scale independent validation of the TSQ as a brief screening instrument with a sample of 562 victims of assault. In a systematic review of 13 screening instruments for adults at risk of PTSD (62), the TSQ instrument consistently performed well and was recommended for clinical use for early identification of persons at risk for PTSD after traumatic experiences. Using a small number of core symptoms can be highly effective in a wide variety of trauma populations. The purpose of choosing TSQ in this study was to achieve an indication of the participants'

mental health. The TSQ was translated into Swedish by associate professor Per-Olof Michel at the National Centre for Disaster Psychiatry in Sweden and revised in 2007 by associate professor Filip Arnberg (54). As far as I know, the TSQ has not been validity tested in a Swedish sample. In this study, the internal consistency was tested with a sample of 51 of the survivors and showed a Cronbach's α of .845. SPSS® version 23 (2014) was used for the analysis.

*Qualitative data collection*
Qualitative data were collected through taped, semi-structured telephone interviews conducted one to three months after the bus crash. The focus was on the respondents' experiences of the crash, their injuries, and their overall care and recovery during the first couple of months. Extensive notes were taken during the interviews, which lasted from 10 to 60 minutes. Thirteen interviews were then transcribed verbatim for analysis, and the exhaustive notes for the remaining interviews were used.

## Data analyses
Three separate data analyses were conducted in study IV: descriptive statistics, qualitative thematic analysis, and an integration using mixed methods analysis.

In the quantitative analysis, MAIS and TSQ scores were organized and combined in Microsoft Excel 2010. Based on the quantitative results and to reach a representative distribution of injury severity, 13 out of the 54 interviews were selected for a thematic analysis. The thematic analysis was conducted to identify and describe patterns that offered more insight into the quantitative results. The coding process in the thematic analysis aimed to identify repeated thematic patterns within the specific areas: physical injuries, mental health, and recovery. Codes were then sorted into main themes and subthemes that represented the interviews. Themes were then reviewed, refined, and named to capture their essence. Finally, themes and subthemes were validated through relistening to all 54 interviews and rereading all interview notes (cf. 64). The quantitative and qualitative results were given equal weighting and integrated through analysis into combined results (65). The quantitative results presented short-term physical and mental consequences for survivors. The groups were then expanded with the themes from the qualitative analysis. After the interpretation and combination of the quantitative and qualitative results from the groups, each group was integrated into a representative "core case" (see Table 2 under Results). The core cases illustrate survivors who share certain experiences and characteristics, such as injury severity, mental well-being, means of recovery, and prominent qualitative themes.

# Ethical considerations

The dissertation includes a large number of respondents and interviews, and ethical considerations needed to be made before, during, and after the interviews.

There are several ethical risks of conducting telephone interviews. Interviewing persons regarding a difficult experience can not only trigger negative feelings, but even worsen a respondent's ongoing recovery. The interviewer needs to be aware of risks and sensitive to how the respondent reacts verbally and nonverbally. In a face-to-face interview, facial expressions and body language can indicate the emotional state of the respondent, but in a telephone interview attention must be paid to more subtle signs, such as silence/pauses, sighs, and the sound of the voice. Important aspects of any interview situation are demonstrated interest and respect and the ability to show understanding and empathy (66). The interviewer in studies I, II, and III (Rasbo crash) was an RN (not part of the research group) with experience in caring for patients with severe injuries. I was the interviewer in study IV. Both interviewers aspired to be empathic in a neutral way during all the interviews.

It has been shown in research that respondents feel that participating in an interview study is worthwhile despite any distress experienced during the interview (67). The level of distress felt when participating in trauma research did not reduce willingness to participate or the perceived benefit of participation when compared to participation in non-trauma surveys (67). There is a curative aspect of survivors' being able to tell their story. For disaster survivors, the telling in itself can bind together the seemingly diverse dimensions of dark and light into a coherent whole and enable survivors to make sense of the experience (56).

In study I (Rasbo crash), the interviews were conducted within the mandate of the SAIA, which gave the researchers legal permission to conduct interviews to gather the information they needed for the official investigations. Five years later the research group sought an ethical approval retrospectively for study I and prospectively for studies II and III. For follow-up studies II and III (Rasbo crash), information letters were sent out to all participants before the interviews. The interviewer telephoned the participants about a week after they had received the information letter, and they could give verbal formal consent or decline to participate. The interviewed survivors were informed that they could withdraw from the studies at any time without giving an explanation, but no one chose to withdraw.

I was the interviewer of the 54 respondents in study IV (Tranemo crash), and the interviews were also conducted within a mandate from the SAIA during their official investigation of the crash. During the telephone interviews, about a dozen of the respondents expressed mild distress. They still wanted to contribute their experiences and carried through with their interviews. Some were open about how they felt and made comments such as "I'm shaking right now, but it is ok, I'm sitting down" and "I'm sweating and my face is completely red right now." Others did their best to hold back their tears during parts of the interview. At the beginning of each interview, I explained that we could pause at any time and for those who did cry, I clearly said it was okay and that we could wait for as long as they wanted. Prior to the interviews I received complete data on their injuries, which were helpful when preparing and conducting the interviews.

In all studies, the respondents would have been directed to further help if anyone showed signs of considerable distress during or after the interviews, but it was not needed.

In study IV, a self-assessment questionnaire (TSQ) was used at the end of each interview. TSQ was chosen due to its limited number of questions, since there would be less pressure on the respondents. If the respondents scored above the cut-off score for being at risk of developing PTSD, I talked to them about the possibility of getting further psychological support. Many of them were already receiving professional support or knew where to seek help if their problems persisted.

All studies have been carried out according to the Helsinki Declaration (68). The participants' confidentiality in the presentation and publication of the results has been preserved in all studies.

Ethical approval for interview data used in study I was given retrospectively. The SAIA conducted the interviews in 2007 as a part of its investigation and did so with the legal support inherent in its official mandate. Ethical approval was received in 2012 for studies I, II, and III (No. 2012-61-31E) and in 2015 for study IV (No. 2015-279-32M) from the Regional Ethics Committee in Umeå.

# Results

The results from all studies offer an overview of survivors' experiences of the crash, the first couple of months afterward, and everyday life after five years.

## Initial experiences after the Rasbo crash (Study I)

Directly after the Rasbo crash, survivors reacted and acted in various ways, such as leaving the bus, staying to help, or remaining passive due to shock. A sense of helpfulness emerged among survivors both inside and outside of the buses. Survivors described that the most important support directly after the crash came from fellow survivors; they talked and helped each other. Half of the survivors expressed that they had helped others, for example, by searching for personal belongings, putting jackets on, sharing paper and blankets, assisting others in getting out of the bus, and offering comfort to shocked and upset survivors. Survivors talked to and supported each other while waiting for emergency personnel to arrive. When emergency personnel were on site, helpful and compassionate acts from them and active bystanders were highly appreciated.

*"There are images coming. / I see the dead persons (with tearful voice). / I see my friend's hand in mine when I check for the pulse. I see the legs sticking out from underneath the bus. I see so many images and smells, the smell that came out of the bus afterwards. / I remember when I took my first breath and felt that I was alive. It was such a strong feeling. I know I was thinking about my children, and got this feeling that I would never see them again. But I took a breath and felt that I was alive, and then I felt good again."*

Psychological stress reactions were evident during the first month among most of the survivors, and sleep difficulties and changes in travel routines were the most common short-term consequences. Uncomfortable experiences were derived from traveling by bus, car, or plane. During the first month after the crash the survivors displayed a diverse need for crisis support. Informal support from family and friends was essential for the early healing process. Some survivors experienced that various needs for professional support were not met, which caused them dissatisfaction.

Survivors tried to seek closure in order to move on with their lives. There was an expressed desire to know the cause of the crash and to know what had happened to injured fellow survivors and the drivers of the buses. It was comforting for survivors to revisit the crash site and light a candle, as well as to meet others

affected by the crash. Getting to know fellow survivors was presented as a positive consequence, which in some cases led to new friendships.

## Experiences of prehospital and emergency care (Study II)

Experiences of the overall care and support on the day of the Rasbo crash were described in both positive and negative ways. Despite some discomfort on the crash site, such as coldness and pain, the survivors recalled mostly positive experiences of the prehospital care they received. It was perceived as efficient and well-organized; e.g., ambulances and helicopters arrived shortly after the crash, and a bus for transportation was quickly arranged. A majority of the survivors were also satisfied with the overall medical care and crisis support offered in the EDs.

*"There was a doctor who was with me all the time; he probably saw that I was shocked. Because I remember when he was going to stitch my wound / He talked and sang to me. I felt how the tears were running down my cheeks, but at the same time I did not cry. He asked me 'Are you with me?' because he was afraid I was going to pass out or something like that. This doctor stayed next to me the entire time, until I had done the x-ray and everything else. Nobody left me alone, so I felt very cared for."*

Having someone close by the entire time was described as essential. The survivors spent hours together at the crash site, and a sense of connectedness was developed among them. However, they were not able to stay together or keep in contact with each other upon arrival at the different health care centers and EDs. Survivors also experienced a lack of compassion and understanding upon arrival at EDs. For example, survivors without family members by their side felt lonely, and their desire to be close to fellow survivors was not recognized or facilitated. Being mistreated or feeling neglected at the hospital caused distress and discomfort, as well as being told by hospital personnel to take the bus home after the crash. Some of these experiences caused lasting irritability and anger over the years.

*"What made me very upset that day was when I asked how I was going to get home, and they told me in the emergency room, 'well, you'll have to take the bus!' / I had to go home in my bloodstained shirt and the jacket I wore in the accident. And then to be told to take the bus home. / I had a bandage on my chin, a bruised face and bloodstained clothes. It was so terribly wrong."*

## Experiences of long-term consequences and recovery (Study III)

Five years after the crash, it had generated visible and existential marks in the survivors' everyday lives. When survivors reflected on the initial time period after the crash, they described it as a time of reflection, rehabilitation, struggles with authorities regarding lost belongings, economic compensation, and arranging sick leave. There was a sense of dissatisfaction regarding not receiving any help or follow-up at all after the crash. Step by step, survivors started regaining their daily lives as they were before the crash or adapting to a new way of living.

*"Immediately after the accident, I was so busy with my injuries and the grief / Then it went more and more towards gaining the power to reclaim everyday life so to speak, to return to a daily life with the pain and the struggle with the insurance company, the insurance fund, and eventually the employer. It has not been so easy to get the help I believed I needed to go back to work as quickly as possible."*

The psychological difficulties gradually faded for most survivors over the years, but not for all. A group of survivors still felt limited in their daily life five years after the Rasbo crash because of psychological complications as well as pain and discomfort. For example, some survivors suffered from back pain and headaches. More serious physical consequences included permanent impairment that restricted everyday movements, such as not being able to run due to constant leg pain. Going back to work without feeling fully recovered from pain and injuries was also common. Survivors felt as if they had aged significantly; they were tired, had a harder time recovering, and no longer had the same energy as before the crash. Apart from the evident physical injuries caused by the crash, many spoke of more vague consequences that might have been connected to the crash, such as tinnitus and concentration difficulties. Varying levels of travel anxiety were shared by the survivors.

Survivors also experienced that the crash had increased their self-awareness, impacted on personal relationships, made them more grateful for life, and resulted in a lasting sense of connectedness among survivors.

*"We always sit and look at each other, if the braking is fast or if it is stormy outside. We have each other as support I believe. ... It feels good, we both know what we have been through."*

There were also survivors who had recovered quickly and did not feel as if the crash had had a negative long-term impact on their lives.

## Injury panorama and experiences of short-term consequences after the Tranemo crash (Study IV)

In the Tranemo crash, interconnection among survivors appears to have had a great impact during the first couple of months of recovery. Survivors and their significant others with whom they had been traveling seemed to be linked to each other in terms of health. If their significant other recovered well, so did they, and if not, neither did they. Psychological recovery was described to be influenced by personal experiences and characteristics, as well as access to crisis support.

*"I visit my friend at the hospital every day or we talk on the phone. But I wouldn't want to stop doing it, because we've talked a lot before too. ... But it's clear that this is being kept alive in a different way than if I had not talked to her. But I have chosen to do so myself ... and I feel that I am a support to them. / The days when I see that she both looks better and feels better ... it is contagious, and we make plans of what we want to do. Then the days come when she is not feeling well, like right now, and it affects me. It does."*

However, injury severity did not seem to influence the risk for PTSD, i.e., having minor injuries did not mean minimal risk for PTSD, and moderate to severe injuries did not relate to an increased risk for PTSD. Among the Tranemo crash survivors, 11 passengers (20%) sustained moderate to severe injuries, and the remaining 45 (80%) had minor or no physical injuries. One-third of the survivors were assessed as being at risk for PTSD (see Table 2 and Figure 4).

Table 2: Core cases integrated from MAIS and TSQ

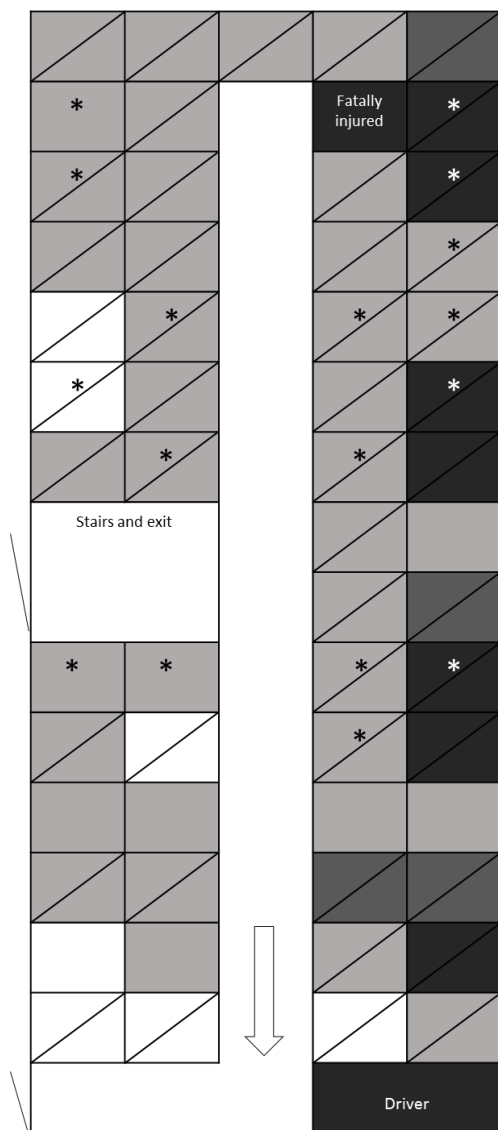|  | **MAIS 0-1** | **MAIS 2-4** |
|---|---|---|
| **TSQ 0-5** | Core case Avery (30 survivors) | Core case Blair (7 survivors) |
| **TSQ 6-10** | Core case Casey (13 survivors) | Core case Daryl (4 survivors) |

Figure 4: The distribution of injury severity and high TSQ scores, as well as seatbelt use, among the passengers on the bus.

The colors represent the injury severity; black: MAIS ≥3, dark grey: MAIS 2, light grey: MAIS 1, and white: MAIS 0. Survivors with TSQ≥ 6 are marked with asterisks. Survivors who were wearing a seat belt have diagonal lines across their seats.

The integrated findings are presented as four "core cases" of survivors who represent a combination of characteristics and aspects hindering and facilitating recovery (see Table 2). The cases have been given gender neutral names.

*Core case Avery* represents a survivor who sustained no or minor injuries, was temporarily affected, and demonstrated a positive mental recovery. Avery sat in the front of the bus on the right side (see Figure 6) together with a family member or a friend who had only minor injuries. Avery and a companion were both able to leave the bus shortly after the crash, and they did not experience many potentially traumatic impressions. Outside the bus, Avery remained calm and sat in a group of people until emergency personnel directed them to gather in a warm bus. Despite having to wait for a long time and having little contact with ambulance personnel, Avery was satisfied with the care offered. Avery experienced that the personnel, active bystanders, and fellow passengers were caring and compassionate. Avery attributed social support, feelings of strength, a positive outlook on life, and previous experience in crises to a successful early recovery. Survivors like Avery had low scores on the TSQ, demonstrating minimal risk of developing PTSD.

*Core case Blair* represents a survivor with moderate to severe injuries who was temporarily affected and experienced a positive mental recovery. Blair represents a survivor who sat in the front of the bus on the left side (see Figure 6). The left arm and head were pulled along the ground or hit by stones, causing moderate injuries. Blair was able to leave despite being injured, which minimized the exposure to potentially traumatic impressions. Blair received medical attention and support from family members and/or emergency personnel, which decreased harmful stress levels. Blair shared the same characteristics of resilience as Avery (e.g., feeling strong and capable, having knowledge of crises, and having a positive and grateful approach to life). Due to ample social support, Blair was able to readjust to a new life and recovered well from a short-term perspective, as reaffirmed by low scores on the TSQ.

*Core case Casey* represents a survivor who sustained minor or no injuries in the crash, but was highly affected, and was at risk of developing PTSD. Casey had a family member or friend who was seriously or severely injured. Shattered glass, stones, and impacts with the bus interior caused Casey's minor injuries. Casey represents a survivor who was sitting in the back of the bus (on either the left or the right side), in the center of a potentially traumatic situation (see Figure 4). Casey tried to help other injured persons or stayed on the bus to wait for help. Casey was disappointed with the emergency care and experienced a lack of medical care and support, either for himself/herself or for a family member or friend. Casey's well-being was also linked to that of a family member's or a

friend's recovery from injuries. Social support was available for Casey, but mental distress affected daily life and Casey was at risk of developing PTSD.

*Core case Daryl* represents a survivor who sustained moderate to severe injuries in the crash, was highly affected, and was at risk of developing PTSD. Daryl represents a survivor who sat on the left outboard side of the bus and suffered from a serious to severe injury (see Figure 4). The injury was caused by sliding out of the seat belt toward the ground, seriously injuring an arm or the head. Daryl was exposed to a highly stressful situation and experienced a long wait for help. Later, the injury had a big impact on everyday life, leaving Daryl to readjust to a restrained life at home. Daryl needed practical help and mental support from family members. Overall health and well-being were also affected by worries and distress among family members and friends. Daryl was at risk of developing PTSD.

The cases share different aspects that were experienced as hindering or facilitating recovery. Hindering aspects (applicable to Casey and Daryl) included exposure to traumatic impressions, perceived life threat to oneself or someone close to them, and impairment due to injuries. Survivors' injuries caused a major impact in their lives and the lives of their significant others. Facilitating aspects (applicable to Avery and Blair) included a perception of initial medical needs being met, adaptive and unselfish responses, positivity and faith, and previous personal or professional crisis experience. The following quote from a survivor fitting the description of 'core case Blair' illustrates the qualitative dimension of these results:

*"I am so incredibly happy and pleased with the outcome. / I'm thinking it was so close. The stone or whatever it was that hit my jaw, I mean, had it hit me five centimeters further down it could have hit the carotid artery or further up I might have suffered brain damage. And I am on my way to recovery. / I really appreciate being outdoors. I think it's fantastic to get the opportunity to be outdoors again."*

## Summary of main results

The combined results offer an understanding of how diverse the survivors and their needs are. There are similarities and differences in the results, which cover both the positive and negative elements of experiencing a major RTC. Certain aspects represent the main results; i.e., the helpfulness and resourcefulness of survivors, the emergent and existing connectedness, the importance of compassion in medical activities, the need for flexible psychological support, and the long-term discomfort and gratefulness. Worth noting is that overall,

most survivors were positive toward the initial help, care, and support they were given.

There was a helpfulness that quickly emerged among survivors inside and outside the buses. Survivors sought to help themselves and others in adaptive ways, such as by taking a protective position before the crash. Survivors described being strong and calm and having the skills needed to handle the experience in a functional way.

In all crashes, a sense of connectedness among the survivors emerged from the crash day and onward, bringing groups of survivors together. The connectedness offered friendships and long-lasting support. There was also an existing connectedness among significant others traveling together, mainly in the Tranemo crash (Study IV), since the social constellations on the buses were different. In the Rasbo crash, most of the survivors did not know each other well, which probably had an effect on early and long-term recovery. It was described that not knowing the dead or injured survivors made it easier to cope with the experience. Survivors helped each other, but were not personally or emotionally attached to fellow survivors. On the other hand, in the Tranemo crash, the passengers on the bus were couples, families, and friends. This existing connectedness affected them in various ways. They stayed with injured significant others, inside or outside of the bus, until further help arrived. Their recovery seemed to be related to that of those they had been traveling with.

Another main result was that survivors described the importance of compassion. The prehospital care was overall experienced as efficient, and survivors were met with compassion; nevertheless, there were exceptions. Upon arrival at hospitals, there was a perceived lack of compassion and understanding in regard to the care and encounters with personnel. The importance of compassion from fellow survivors, emergency personnel, and significant others stands out throughout all studies. Survivors' experience of support varies considerably. Overall, the psychological support offered was not experienced as well organized or proactive; rather it was short-term and sporadic. In the Rasbo crash (study I-III), survivors lived in different municipalities, and support did not reach all survivors who considered themselves to have needed it.

The long-term results show daily discomfort and distress from injuries and psychological difficulties, an increased sense of traffic safety, as well as gratefulness for being alive. Feeling grateful was a common long-term trait among the survivors, which brought a greater appreciation for life and seemed to enable survivors to make major life decisions.

# Discussion

The aim of this dissertation was to broaden the understanding of the short- and long-term consequences and experiences of surviving a major bus crash, in order to improve survivors' care and recovery. The survivors, as entities composed of physical, psychological, and existential dimensions, and their perspectives were placed at the center of attention in all studies.

The main results and aspects that are important in moving toward a greater understanding of the survivors are discussed in terms of six themes: helpfulness and the resourceful survivor, emergent connectedness among survivors, existing connectedness among significant others, the importance of compassion in medical activities, the need for flexible psychological support, and discomfort and gratefulness as coexisting long-term consequences. Lastly, the discussion will end with a concluding theme, named Striving toward health for survivors through a broader understanding.

## Helpfulness and the resourceful survivor

Survivors showed great resourcefulness and adaptive behaviors (studies I, II, and IV). It became clear that being a bus crash survivor did not equal being a passive victim. The survivors had various backgrounds and professions, and they possessed strengths, knowledge, and skills that were valuable during and after the crashes. During the initial stage, especially before emergency personnel arrived, most survivors were not passive or in panic; instead, they did what they could to help known and previously unknown fellow passengers. In the Tranemo crash (the survivors of which were traveling in couples or in small groups) the feeling of wanting to protect and help a severely injured relative or friend was strong, but there were also persons who comforted and helped fellow passengers previously unknown to them (study IV). The survivors' behaviors following the bus crashes offer insight into the interaction among survivors and demonstrate how important it was for them to have each other. Similar helpful behavior was found in a study on train crash survivors, who described that focusing on helping other passengers on-site was one way of regaining a loss of control and keeping the chaos at bay (69). The immediate helpfulness (mainly in study I and II), which can be seen as the beginning of the sense of connectedness among survivors, is a behavior worth promoting.

There is a need to highlight the survivors' own responses during the phase immediately following the crash and to acknowledge their resourcefulness. Feeling as if you are capable and have the necessary resources can promote

psychological recovery (47). To stimulate a sense that affected persons, as well as their community, have these necessary skills and resources to overcome and cope with problems is an essential part of helping the affected to recover (70). Promoting this sense of efficacy can be done preventively before a disaster or major incident occurs. Health promotion interventions are implemented when there is a risk but not yet an illness. In the same way, helpful attitudes and behaviors that will promote readiness and capacity for severe life changes (e.g., surviving a major bus crash) can be implemented among individuals and within communities (71).

Another area in which the survivors displayed dedication and involvement after the crashes was within traffic safety, and especially regarding buses. As mentioned in studies I, III, and IV, the survivors experienced increased concern for traffic safety and an interest in injury mechanisms in bus crashes. The survivors were very concerned with their own and other's safety; they emphasized the importance of always wearing a seatbelt and reflected upon existing safety risks inside and outside of buses, such as the state of roads and drivers, and the design of luggage storage and bus interiors (e.g., bus windows and seatbelts). Survivors themselves expressed that they became aware of how simple safety measures can save lives and minimize injuries. Getting into a protective position before the moment of a crash (which was done in study IV) was one example of simple actions that might have saved people from more serious injuries.

## Emergent connectedness among survivors

The sense of connectedness that emerged and was formed among fellow survivors initially offered emotional support and safety (studies I and II), and it even developed into lasting friendships throughout the years (study III). A considerable need for social support is evident in all studies. This became especially noticeable in study II, in which it was found that many of the survivors had wanted to spend more time together with fellow survivors. The SAIA played an important role in the recovery process by arranging an information meeting with a viewing of the buses for the survivors within six months after the Rasbo crash. The viewing was part of presenting their findings from the investigation of the bus crash (57). The survivors were living in different cities and found it greatly beneficial to meet each other again and to be informed about the crash. After the Tranemo crash (study IV), the SAIA arranged a similar information meeting for survivors and their significant others about five months after the crash.

The role of social connection is emphasized in the literature as very important for a person's psychological recovery from a trauma (45). The importance for the survivors of staying close to fellow survivors or their family members in order to calm down (Study II, IV) is in line with literature emphasizing that social connections are to be created as soon as possible for those who are strongly affected, in order to stimulate recovery. Assisting people to maintain these connections over time is also crucial (72, 73). Connectedness with others affected by the same event can for example provide knowledge and experience sharing, emotional understanding and acceptance, problem-solving, and normalization of reactions (47).

The emergent connectedness among survivors ought to be promoted throughout the crash day and onward. Places where this can be made possible are at the ED and later at hospital wards, or at a health care center or a gathering place. If the event is large in scale, with a large number of affected, the demands on a suitable gathering place can be high. In a government report on the terrorist incidents in Norway on July 22, 2011 (74), one of the final recommendations was to incorporate the use of hotels into municipal emergency preparedness plans. This would provide survivors and affected others with a sympathetic setting in which necessities such as food, refreshments, and private rooms would be available.

Little attention has been paid to the importance of social interaction and connections before professional help arrives or to how beneficial spontaneously formed social connections can be, specifically after major RTCs. Further empirical research is needed to explore these topics more thoroughly. Also, although connectedness and social support is one of the most empirically validated support principles, it is still rather unclear how to translate this into interventions (47). As seen in the results of study III, the central health-promoting role of social connections ought to be a long-term support system, extending for months (75) or years (76).

### Existing connectedness among significant others

Another topic that deserves attention after a major bus crash is the social context/constellations on the bus; that is, whether the passengers were traveling alone or in groups or couples. The relationship to fellow survivors is a factor that seems to influence individual recovery. The social contexts were slightly different in the two bus crashes studied; in the Rasbo crash, most of the passengers were commuters who were only slightly acquainted with each other or were strangers. In the Tranemo crash there were existing relationships among members of couples, close friends, or groups of coworkers.

In the mixed method study (IV) it was found that social factors and relationships on the bus appeared influential in relation to the survivors' subsequent health and recovery. In some cases, survivors' recovery seemed to be influenced by the recovery of an injured significant other. The survivors' mental health recovery seemed to be affected if a significant other was injured in the crash and struggled during recovery or if the survivor had feared losing his or her significant other in the crash. It is likely that the aspect of feeling as if you are linked to someone else's recovery was more prominent after the Tranemo crash (study IV).

Among the initial reactions, the "tend and befriend" reaction became especially noticeable in study IV, after the Tranemo crash. Tending can be described as nurturing activities that aim at protecting the self and family members through promoting safety and decreasing distress (21). Befriending is when a person creates and maintains social relations that can aid the process of tending. This response pattern is obvious in the cases of both buses, but especially the Tranemo crash, as many uninjured survivors chose to stay on the bus with their loved ones and care for them in any way they could. In some cases, survivors were very reluctant to leave the side of their significant other even when emergency personnel were at his or her side (study IV). This can be compared to the Rasbo crash, where the evacuation of the buses was rather quick and survivors left the buses as quickly as they could (Study I and II).

One of the main initial ways of promoting recovery among people affected by disasters or traumatic incidents is to promote a sense of safety and calming (47). One way of doing this is to make sure family members and important others can stay together and not be separated in the immediate phase. During the aftermath of disasters, the primary concern and desire is to get information on the safety and survival of family and friends. Fear of what has happened to loved ones can in some cases be greater than the fear one feels for oneself. Separation from significant others and uncertainty about what is happening to them can be the leading stress factor for a person. Concern for the safety of family members may be more crucial to survivors than their need to be connected to other support (47).

Regarding the well-known benefits of being close to significant others after a traumatic event, an area of concern in present studies is the separation of significant or important others in the immediate phase (mainly in study IV). There were cases on the crash site and in connection with transportation in which survivors with physical injuries was separated from significant others with no visible injuries. One example was not being allowed to go in the ambulance with a significant other and instead being transported by bus to a

health care center with unknown fellow survivors. Not knowing what is happening to a significant other can cause great suffering. In study IV, uninjured survivors who had been separated from a significant other or had lacked information on the state of an injured relative, showed poor mental health after three months (i.e., a risk for PTSD in the TSQ screening).

The example of separating family members is of concern and can be considered an example of a "crash between disciplines," in this case, between the caring sciences and disaster medicine. Under normal circumstances it is implicitly understood that a family member or another significant other can join the affected person in an ambulance to act as psychological support. However, triage systems do not consider emotional bonds, and in communication with hospitals regarding distribution of patients, there is no space left to include persons representing existing psychological support. The sole focus on a person's physical injuries may deprive another person in the relationship of a social bond that is crucial to his or her recovery and health. This issue could be reconsidered with regard to the aftermath of major RTCs, especially when it can have such a considerable effect on the subsequent recovery and mental health of survivors, as seen in study IV. Reducing initial psychological distress among survivors, i.e. promoting calming strategies, is therefore essential in safeguarding their mental health and ability to recover (47). After the London bombings of 2005, a delay in being connected to loved ones was a major psychological risk factor for subsequent substantial stress (77).

Survivors in all studies and their family members also described feeling saddened by non-empathic professional encounters, mainly during their stay in EDs/hospitals or when leaving the hospital. In mass casualty situations with many injured, survivors with no visible injuries will be triaged with a low priority upon arrival at hospitals. Survivors without any visible injuries can thus be considered to have no apparent need for immediate help or support. This was the case after the Rasbo crash (studies I and II), in which survivors with no or minor injuries described having been treated in a way that caused further distress. If possible, setting aside personnel solely responsible for uninjured survivors would be beneficial in these rare situations.

## The importance of compassion in medical activities

To avoid generating further suffering, there is a need for an emergency organization to promote compassion and understanding toward those who are sent to a hospital with minor injuries or no visible injuries at all. Compassion can be defined as "being sensitive to the suffering of others and showing a commitment to relieve it" (78). A main finding in studies I, II, and IV was how

important compassionate acts were for survivors' experienced well-being and initial recovery. Compassionate acts were highly valued, and the importance of compassion is a thread that connects the results from all four studies. It applies to all the interactions among affected persons: between survivors, between survivors and emergency personnel or other professionals, and between survivors and significant others.

In the present studies, the opposite, a lack of compassion, was experienced from health care personnel and it was mostly noticeable upon arrival at hospitals. This lack of compassion and understanding seemed to afflict survivors who were alone. The results from studies I and II that cover the negative encounters or experiences at health care centers, EDs, or hospitals are in line with findings from other studies regarding negative patient experiences within the Swedish health care system. For example, a Swedish report on survivors' experiences of care in Sweden after the Southeast Asian tsunami in 2004 showed that they were satisfied with the somatic care given, whereas other types of treatment and care within the health care system at times were described as terrible. Survivors had negative experiences in encounters with physicians, psychologists, and counselors, which caused them to stop treatment or deterred them from seeking further help (79).

In a study on the experiences of care and rehabilitation after being injured in traffic, one of the main findings was that the quality of interactions with care providers was of great importance (80). Lack of support from caregivers caused anxiety and uncertainty among survivors. Survivors provided examples of being met with a disinterested and nonchalant attitude, insensitivity being displayed toward their needs, and being discharged without any conversation or information. In some cases, "a total lack of compassion" was expressed (80). These experiences are considerably similar to those described by survivors in study II. Other examples are from studies on care encounters in EDs. A study on ED personnel's views on competencies and their value revealed that there is a polarization between medical and caring competencies as well as tension between professional groups in EDs. Medical competencies were valued more than caring competencies, thus the role of caring for and being compassionate toward affected persons was downgraded (81).

In a systematic literature review of qualitative studies on patients' experiences within the ED, the intent was to describe what factors affect their experiences. According to the articles under review, the most emphasis was placed on the experience of caring or lack of caring regarding patients' psychological and emotional needs. Patients highly appreciated when good nursing care was given, which was described as, for example, staff being attentive to their needs, making

eye contact, and taking time to listen (82). When it comes to emergency care, it is characterized by life-saving medical actions, which implies the physical presence of the professional. A Swedish study focused on the meaning of emergency care of patients at the scene of an incident and in the ED described that this physical presence also constitutes existential support for the person in need of care. However, the existential support is diminished when the professional takes a step back, for example when the condition of the person no longer requires physical closeness (83). For the person being cared for, this physical space can also create paradoxical feelings of not being interesting enough. From a professional point of view, it may be true that a person who no longer has a life-threatening condition is not as interesting or in need as before. An ethical dilemma can be created in this situation, since taking a step back also means an opportunity for the professional to get breathing space (83).

After the terrorist incidents at Utöya in Norway on July 22, 2011, response personnel both in the immediate emergency and in long-term follow-up were concerned with how to deal with traumatized persons and insecurity regarding whether they needed specialist psychological support. In the report, it was recommended that relevant health personnel should be trained and prepared to care for people who have experienced serious psychological trauma (74). It is worth mentioning that even psychologists and other professionals working with psychological support may lack experience of and knowledge on a person's suffering after unnatural and traumatic deaths, since they do not occur very often (84).

The National Board of Health and Welfare in Sweden also emphasizes the importance for all health care personnel who will meet affected survivors, their families, and bystanders to have adequate education and experience in psychological support (85). For personnel working where survivors might seek help (ED, hospital, and health care centers), there needs to be an awareness of the impact their actions or nonactions in encounters can have on the survivors and their families. Small empathetic actions can have a major impact. This could mean simply reflecting on survivors' practical needs before telling them that they can leave the hospital; for example, are they alone? How will they get home? Do they have clean clothes to wear? It is important to understand that an extraordinary situation may entail extraordinary efforts in making sure survivors are cared for properly.

Clearly, to try to satisfy all needs after a major incident with possibly many affected is a complex task. Yet, after first aid and initial life-saving actions, there are simple ways of helping persons who are in need. "Psychological first aid", which aims at reducing the immediate effects of traumatic events as well as

supporting adaptive aspects in the short and long terms, is a way of offering practical psychological support (48). Psychological first aid (PFA) includes a variety of guidelines, such as establishing compassionate contact, providing physical and emotional safety, calming distressed and overwhelmed persons, asking how to help with immediate needs and offer practical help, helping persons to get in touch with significant others, communicating information, and providing contact with further help and support (48). All of these supports ought to be possible to provide in a reasonable time after physical lifesaving first aid.

In Sweden, the crisis teams at hospitals are intended to lead and coordinate psychological and psychiatric care and support of affected persons, relatives, and personnel in case of a serious event. Major RTCs are rare events and these situations are not regular occurrences for hospital personnel, who may lack experience. Since the results revealed a lack of understanding of survivors' needs as they arrive at hospitals, I believe that further research is needed to explore the knowledge of, for example, PFA or contemporary psychological and social support among personnel at EDs and hospitals.

There seemed to be an awareness of the scale and severity of the situation in the prehospital setting, but when the survivors were transported to different places (hospital, health care centers, gathering places, home) recognition of the severity of the context seemed to diminish (study I, II, and IV). It is possible that everyone present at the crash site (survivors, personnel, and bystanders) shared some form of created context together, which may have promoted a positive perception of the prehospital care. Once the survivors were separated and sent to these various places, the created context disintegrated and the survivors became "normal" patients. Later that day, those who encountered survivors who looked uninjured may not have realized the extent of the crashes.

Several ways of implementing compassionate care in health care settings have been discussed (78). Compassion can be enhanced through exploring the potential of brief opportunities for communication as well as through training and educational and organizational design. When developing contemporary health care systems, the general design and organization of compassionate care ought to be addressed, not individual practitioners' lack of it. It ought not to be an individual task or responsibility to provide compassionate care, which is an organizational issue and needs to be implemented and encouraged from the management (78).

Offering presence and compassion in a care encounter takes little time. There is no dichotomy between technically advanced medicine and human values; they are compatible, complementary, and both necessary, especially after

extraordinary events (86). Compassionate care is a part of person-centered care (PCC), which is a viable approach toward achieving a broader understanding of the various needs of RTC or major incident survivors.

## A need for flexible psychological support

The survivors themselves did not seem to differentiate various kinds of support in the phase immediately after the crash; instead, they seemed to consider all encounters as support (or lack of support). For example, a firefighter, a police officer, an ambulance nurse, a volunteer from the Red Cross, a physician, a hospital priest, a nurse, a psychologist, or a person in the ED reception area each represented an encounter that left a psychological mark on the survivors. This exemplifies the complexity of defining various forms of psychological and social support after a major incident.

As mentioned in the results, even though many felt satisfied, the psychological support offered appeared rather rigid and with ad hoc-solutions. The survivors became fragmented groups and ended up at various hospitals or health care centers, and thus, their experiences of psychological support varied greatly (study II and IV). Active follow-up of survivors (from the health care center, municipality, or others) has in present studies been described as inadequate and affected survivors have experienced this as problematic. The responsibility for getting additional medical care and support was in most cases placed with the survivors themselves (after both the Rasbo and Tranemo crashes), even though some were suffering immensely after the crash. Survivors found it difficult to ask for additional support even though they felt a need for it (studies II and IV). Instead, they waited a long time before choosing to contact anyone. Tranemo survivors expressed how they tried to deal with their injuries and mental problems completely on their own during the first couple of months. After both crashes, the immediate aftermath was characterized by an ambition of involved organizations wanting to provide a high degree of support (though not reaching all). However, it has been shown that support systems can quickly deteriorate because people need to get on with their lives, and this leaves those with initially minimal support vulnerable in the intermediate and long-term phases (47).

According to the National Board of Health and Welfare's crisis support recommendations, it is important to offer support, to carefully assess those who develop symptoms or those whose symptoms do not decrease with time, and to conduct active follow-up (54). Early detection and referral of those with substantial psychological difficulties is essential (49). It is noteworthy that only 17 out of 54 Swedish emergency hospitals have routines for screening for acute stress disorder or PTSD (85). An important question remains: Who should have

the main responsibility for conducting comprehensive and continuous follow-up?

A practical, viable, and cost-effective way of doing this could be through telephone calls to survivors (87, 88). A short screening model could be beneficial for this purpose, such as the Trauma Screening Questionnaire which was used in study IV.

A study on psychological support by Dyregrov et al. (84) gave voice to 103 bereaved persons after the terrorist incidents in Norway 2011. Among the bereaved, some had not been contacted by a helper, did not receive a contact person, or were not followed up for a sufficient time. One of the central strains for the bereaved was a "lack of understanding," i.e. a helper's lack of empathy and lack of understanding of the situation for the bereaved. An increased understanding of how the specific situation affected the bereaved was desired, as well as professional helpers taking them seriously. They also wished for better connection and chemistry with the helpers, as a lack of it affected their treatments. The study also generated several pieces of advice from the bereaved on what was important in the follow-up after traumatic losses. The advice was in line with the official guidelines recommended. This is an example of how valuable it is to have a close dialogue with the affected or involved persons after traumatic events.

The experiences following both the Rasbo and Tranemo crashes illustrate how survivors are to varying degrees vulnerable and resilient to traumatic stress. A majority of the survivors expressed that they were pleased with the care and support offered (studies II and IV). As mentioned before, all positive human encounters could be considered a form of psychological support. In study III, about two-thirds of the survivors would be considered to not have extensive psychological difficulties, which correspond to previous research on traumatic stress and mental health. For example, among persons exposed to a potentially traumatic event, about two-thirds will recover without serious and/or long-term consequences (25).

The aspect of psychological support is closely linked to social support, i.e., beneficial relationships with other people. After major incidents with many casualties, informal social support (in the form of both emergent and existing connectedness) is usually all that is needed for physically uninjured persons.

However, it is important to remember that having a social network does not per se imply access to support, since a member of a support system, such as a family member, might provide undermining messages (e.g., minimizing of problems,

blaming, unrealistic expectations of recovery) (47). This negative social support is a strong correlate to long-term distress after a trauma (90).

Social support is a top recommendation after disasters or major incidents, but there is a research gap in how to transfer the natural positive effect of social support into intervention-created social support (47). One example is to organize support groups. However, there is little evidence on such groups after traffic-related injuries. There is a study on the efficacy of multidisciplinary group interventions following minor traffic-related injuries (89). In a randomized controlled trial, 127 persons with traffic-related acute minor injuries (predicted to be at risk for delayed recovery) were randomized into an intervention group or a control group. The aim of the intervention sessions was to give information about injuries in general, encourage self-care, and promote physical activity. The significant outcome in this case was that 52% of the patients in the intervention group and only 30% of the control group reported self-perceived recovery at 12 months after the injury.

To conclude, social support through connectedness ought to be promoted and incorporated more clearly into initial treatment and care of survivors and their relatives. If maintained, the beneficial connectedness can act as a long-term health buffer.

## Discomfort and gratefulness as coexisting long-term consequences

In study III both visible and existential marks in the survivors' lives were described when the survivors were followed up after five years. Certain long-term consequences stand out, such as the long-lasting physical and psychological disruptions and problems that are still present in everyday life. Another aspect is a distinct sense of gratefulness for being alive and a humble appreciation of life.

In the follow-up, it is apparent that, apart from daily physical discomfort due to long-lasting injuries and lasting pain, distress and anxiety in traffic situations are a common negative and present consequence for the survivors. Travel anxiety has been found in survivors of road traffic injuries (e.g. 91), but there is still little empirical knowledge of travel phobia and travel anxiety after major RTCs. This is unfortunate since there exist short and effective therapeutic treatments that can significantly reduce the discomfort in traffic (92). Long-term recovery for RTC survivors can entail having to adapt to a new reality and not being able to go back to the ordinary life they had before (93). There exists a comorbidity between long-term physical and psychological symptoms, but the

survivors themselves may not attribute their physical symptoms to their traumatic experiences. It is therefore important for physicians and primary care providers to be aware of the long-term consequences after a major RTC, for example that physical symptoms may persist for several years after the event (94). A long term follow-up study on 507 RTC survivors presented that psychiatric outcomes and pain were not related to severity of injury (53). A majority of the survivors had only suffered minor injuries, but after three years 26 % of them had symptoms of mental disorders and 21 % of them suffered from moderate to severe pain.

The results in study III highlight the need for organized long-term follow-ups after major incidents in order to reach those who face consequences that restrict their daily life and to refer them to additional help and support. The report on the terrorist incidents in Norway (74) highlighted the importance of municipalities being prepared to take responsibility for and provide long-term follow-up after disasters.

Experiences of coexisting with discomfort and/or disrupting physical consequences had an existential impact in the survivors' lives. Feeling grateful for surviving the crash was one of the most recurrent experiences that survivors described at three months and five years after the crash (study IV and III). This is similar to descriptions in a study on train crash survivors, in which survivors expressed a sense of being given a second chance in life (69). These descriptions from survivors go well together with other aspects connected to the concept of PTG, such as becoming aware of the grace and significance of life, appreciating connection with others, and recognition of the spiritual dimensions of life (95). Based on a meta-analysis of 103 studies on PTG, it was found that increasing optimism, social support, and spiritual coping skills could promote psychological recovery after a traumatic event (44). PTG is a positive outcome for survivors, but it often seems to coexist with distress. It was shown in a study of 79 road trauma survivors that, at four years after the crash, 87% of the sample still experienced PTS difficulties and at the same time, 99% of the sample had experiences of PTG (40). There is a need for an increased awareness of disaster survivors' and their relatives' need for existential care after having gone through life-changing experiences (96). A person's life view can be turned upside-down when he or she is faced with how fragile life is, and this may require a different kind of support. In the aftermath of a traumatic major incident, personal encounters and social connections inherently affect people's entire understanding of life (55).

In study III there were survivors who had made various life changes after the crash, such as getting a divorce, moving to a new city, changing jobs, and

spending their spare time in a completely different way. Having a greater appreciation of life combined with the knowledge that life is fragile may have caused the survivors to reassess the lives they were living. Studies have confirmed that personal development within survivors can lead to major changes in life, such as leaving a marriage or deciding to have kids (97). After the tsunami disaster in 2004, survivors described an awakened desire for authentic relationships and discarded more superficial connections in their lives (55).

Having experienced a traumatic situation, including severe injuries, fear of death, or the loss of a loved one, can involve a drastic life change. It also means having an experience of the negative or "evil" aspects of life. This is an experience that can create a clearer vision of what is good in life, such as close relationships, compassion, health, and hope. Both the Rasbo and Tranemo crash survivors described spending more time at home with their families and with their children than they had before the crashes (study III and IV). In order to understand and appreciate the good aspects of life, one must also have experienced the opposite (56). This interconnection between good and bad aspects of life can add a new salutary dimension to survivors' lives. For persons who are living with and caring for survivors in the long term, there is value in understanding the chaos, contradictions, and sudden changes within survivors, and knowing they are a part of a natural, existential struggle (56). In dealing with long-lasting consequences, both good and bad, the idea of instilling hope is one way of helping survivors find a way back to health or a new way of perceiving health. Hope can help a survivor to feel confident that a positive future outcome is possible (47).

## Striving toward health for survivors through a broader understanding

When a community is faced with a disaster, saving lives is always the highest priority. However, in a resourceful context, major RTC or disaster survivors could evidently be offered more than life-saving and injury minimizing efforts. The ambition ought to go beyond a successful emergency response and initial medical treatment and move toward all-encompassing care for the whole person and his or her health in the long run.

To try to understand my results better and to weave together the many aspects concerning survivors after a major RTC, I want to discuss the salutary perspective on health introduced by Antonovsky (98), and his theory "Sense of Coherence" (SOC) (99). Antonovsky's salutogenic model focuses on studying the strengths and weaknesses of promotive, preventive, curative, and rehabilitative

ideas and practices regarding health. It suggests that one ought to study a person from a perspective in which the person as an entity is in focus, and that the person's illness, injury, or difficulties are contexts. His thinking harmonizes well with the previously described health definition, person-centered care, and the theoretical caring concept of seeing a person as an indivisible entity (3). Antonovsky discusses the "bias of the downstream focus," which stems from the idea of heroically saving people from drowning in the river (disease prevention) instead of moving upstream and questioning who and what it is that makes people fall into the river in the first place (health promotion). According to Antonovsky, this was a major step forward in the way health was studied and promoted, but he implies that the reality is actually somewhere between these different perspectives and that both are needed (98). He suggests that the dimension of health and unhealth is a continuum, and that everyone is somewhere on this continuum. Life is filled with stressors and it is difficult to determine the exact consequences they have for people. The stressors create tension, but are in themselves not necessarily negative. Instead, the way people handle this tension is crucial to their recovery.

Antonovsky is the founder of SOC, which he defines as a global stance that expresses the extent to which one has a profound and lasting but dynamic sense of confidence that the stimuli deriving from one's inner and outer world during the course of life are structured, predictable and comprehensible. Further, SOC is feeling as if the resources that are required to meet the demands of these stimuli are available, and that demanding situations are challenges, worthwhile investment and commitment (99). It is put forward that SOC is an important factor for maintaining one's position on the health-unhealth continuum and for striving toward the health direction.

The three key components included in SOC are: comprehensibility, manageability, and meaningfulness. Having a strong sense of comprehensibility means believing that the stimuli you will face is predictable and/or can be explained, and that life itself is comprehensible. When compared to the bus crash survivors, many of them show signs of wanting to understand the crash fully. They had a desire to put together pieces of information to get an understanding of what had happened and why, which left them more at ease and able to move on. The second component is manageability. People with a strong SOC can, for example, consider traumatic life events as experiences and challenges that are manageable or at least endurable, whereas people with a weak SOC seem to consider themselves to be unlucky, and that unfortunate things will continue to happen to them (99). The bus crash survivors are on this continuum, and some describe how they have grown as a person after being able to manage the crash experience. The last component, meaningfulness, is about

feeling that life has an emotional meaning. Also, that it is worth investing energy into challenges that arise along the way, rather than seeing distressing incidents as burdens one would rather be without. Some of the survivors display a strong sense of meaningfulness when describing how important life still is to them despite their injuries, pain, or other difficulties. For example, a survivor told of how meaningful and enjoyable it was to be able to go out walking in the woods again a couple of months after being seriously injured and nearly killed in the crash.

Research within the disaster and emergency medicine field needs to be broad and multifaceted, as disasters and major incidents are unpredictable, ever-changing, and demanding. But it also needs to be unassuming, open-minded, and humble enough to try to understand the affected persons.

Antonovsky points out the importance of looking beyond the disease or injury of a person, and to take note of their experiences, overall life situation, and potential suffering – i.e. the whole person. He also emphasizes the importance of seeing the strengths and resilience in humans, rather than merely pathology or prevention (99). I want to bring forward the idea of introducing a more nuanced and person-centered view of survivors after major incidents or disasters. Survivors are multidimensional persons, inhabiting a range of individual strengths and weaknesses, knowledge and experiences, and risk factors and health promoting factors, and as various as their resources are, so too are their needs. In a disaster or major incident context, resources are scarce and not everyone will be able to get the professional medical and psychological treatment they need. It may be beneficial to promote and engage already existing resources, such as involving capable uninjured survivors, increasing psychological help and support through emergent and existing connectedness, and offering something we can all give regardless of the scenario – acts of compassion.

To conclude, I want to reconnect to the before-mentioned "bias of the downstream focus." Antonovsky used this river metaphor to illustrate and suggest a point of departure regarding research on health:

"We are all, always, in the dangerous river of life. The twin question is: How dangerous is *our* river? How well can we swim?" (98).

# Methodological considerations

## Choice of methods

The work discussed in the present dissertation started as an inductive qualitative project and had an emergent design. When choosing methods, the aim was to try to reach a wide-ranging understanding of the survivors by describing and analyzing their experiences. With qualitative research, it is possible to achieve insight into survivors' perspectives and to go deeper into areas such as reactions, behaviors, and overall consequences on an individual level. From my basic methodological assumption, the experiences of the survivors are equally valuable and are weighed equally. What are of importance are the experiences of the phenomenon of surviving a bus crash, not the number of survivors sharing a specific experience or consequence.

Qualitative and quantitative methods are complementary, and the ambition is that the present dissertation, with an emphasis on qualitative methods, can complement previous quantitative studies as well as form a ground to build upon in future studies.

The aim of studies I, II, and III was to explore similarities and differences among survivors from the Rasbo crash to gain a deeper understanding of that specific case. This led to a decision to use qualitative content analysis (59) in all three studies (I, II, and III), which enables comparisons between the studies as well as the ability for them to complement and build on each other.

Studies I and II encompassed a thorough description of the setting, the short-term experiences, and the survivors' perceptions of the prehospital and emergency care offered. In study III the objective was to explore the consequences for the survivors in a long-term perspective. Qualitative content analysis was selected since previous research on long-term recovery is still scarce and there is a need for further exploration of the phenomenon. Data were analyzed on a deeper level, resulting in an overarching theme.

The objective in study IV was to explore the short-term physical and psychological consequences and recovery among the survivors after the Tranemo crash. The research objective was rather complex, and therefore it was designed as a mixed methods research study (65, 100), in which parallel data collection was followed by an explanatory sequential analysis (65, 101). The qualitative and quantitative data were weighted equally, and the integration was added to the comprehension of those results.

## Trustworthiness

In qualitative research, trustworthiness is an overarching concept encompassing methods for describing aspects of trustworthiness in qualitative studies (102). Lincoln and Guba (103) have suggested criteria for assessing trustworthiness in the hermeneutic paradigm of qualitative research, namely credibility, dependability, confirmability, and transferability (103). In the present dissertation, these four criteria for qualitative research will be discussed.

The participants involved were highly relevant to the studies and chosen because they could share their experiences of the phenomenon under study: survival of a major bus crash. Choosing participants carefully increases the credibility of the results. Also, using representative quotations that can be traced back to the original interviews facilitates readers' ability to judge the credibility and adds to the transparency of the qualitative analyses (102). The interpretations of the texts that have been made are considered credible because of thorough analyses with several researchers agreeing on the results. Other researchers can interpret different results, but likely in the immediate vicinity of the existing ones. Since a text can imply many different meanings, the researcher's task is to present the most probable meaning (104).

When conducting the qualitative content analyses, it is of importance to give priority to the voice of the participants over that of the researcher in the presentation of the results, which increase dependability as well as credibility (102). The studies' dependability and transferability are strengthened by clear and thick descriptions of the case settings, the participants, the methods, and the interviews (105). For all the qualitative analyses, there was a validation phase which included rereading the interviews and listening to the interview audio files. Categories and themes were adjusted and refined among the authors when needed.

I was not the only researcher involved in the analyses, and I was aware of my own preunderstandings before conducting interviews in study IV as well as when analyzing interview data. These aspects strengthen the dependability (102). I was not involved in conducting the interviews for studies I, II, or III, which made it easier for me to put my preunderstanding in brackets when going into the analysis phase.

In assessing the confirmability of the retrospective study II, recall bias has to be considered. The interviews in study II (which focus on crash day) were conducted five years after the Rasbo bus crash, and memories could have been weakened or distorted over the years. Since the focus was on aspects that have had an impact on the survivors in a positive or negative way, most participants

seemed to be able to remember those experiences. There is evidence that traumatic experiences can be remembered even many years after the event. A study on disaster survivors showed that time elapsed since the event had a small impact on what was recalled (106). On the other hand, it has been reported that people have a tendency to forget events, even highly negative phases in their lives (107). There is of course a possibility that some of the survivors have forgotten negative or positive experiences.

The interview guide for studies II and III consisted of 19 questions, only one of which dealt with the day of the crash: *"What is your perception, in retrospect, of the care you received after the crash?"* Questions covered the time span from the crash up to five years later; that is, our focus during data collection was on long-term experiences. The respondents were not asked to recall anything specific in detail. However, the respondents chose to describe their experiences of the crash day to such an extent that it made up a large part of our data. Due to the ample material (a total of 226 pages of text) and the inductive analysis approach, it was important to analyze and present both the short- and long-term experiences. In the original text, the text passages covering the crash day were extracted and analyzed in study II, and the longitudinal aspects were extracted and analyzed in study III.

The number of respondents in all studies increases overall transferability and robustness. Within disaster medicine research there are ethical and practical difficulties in reaching all survivors after for example a major RTC, and therefore a considerable strength of this dissertation is the extensive study populations. The inclusion of the total population from the Rasbo crash in study I and response rate of 96% five years later in studies II and III is a major strength. Another strength of studies II, III, and IV is that they are based upon primary data source, i.e., the survivors' experiences. Ultimately, it is up to the reader to decide whether the results are transferable to other phenomena, such as surviving a train crash. The rich descriptions of the contexts of the bus crashes as well as of the participants add to the transferability (102).

## Mixed methods research and validity

To ensure the validity and credibility of study IV and the mixed methods strategy used, there is a need to check both the quantitative scores and the qualitative findings (65). Having almost a total population of a specific case for the quantitative data strengthens validity. In this case the quantitative results could be more advanced, but they are adequate for fulfilling the study's aim. Validity is strengthened by the use of the same sample of participants for each phase of the study, making it possible to build on and explain the quantitative results (65).

One limitation lay within the use of the TSQ, which is not yet validated in a Swedish context. The TSQ has been validity tested in previous studies (61, 63), but not with a Swedish sample of survivors from a major incident. The high internal consistency (.845) in study IV shows that the TSQ is reliable even though the number of items is low and the sample is small (n = 51 out of 54). The three persons who were excluded did not answer one or more items, and therefore they were not accounted for. In combination with the earlier studies, TSQ can be considered useful both in research and in clinical work for determining whether persons involved in major incidents are at risk for developing PTSD. However, further research in specific contexts, such as the Swedish, is needed to fully ensure its usefulness.

In the mixed methods study (study IV), I planned and conducted all the interviews, and my previous knowledge of the subject guided the planning phase and the mixed methods analysis. In the first phase of the thematic analysis the process was abductive, and I was moving between the interview text and the quantitative results (injury data and TSQ). My preunderstanding was put in brackets during the thematic analysis and compilation of themes.

# Conclusions

A survivor of a major RTC ought not to be considered a victim. Most survivors were resourceful; they performed self-aid, exhibited helpfulness, took protective positions in the crash phase, and displayed resilience in the long term.

It is important to acknowledge that the survivors had various needs, such as medical, practical, emotional, social, and existential.

Emergent and existing connectedness was healing from both short- and long-term perspectives. Being separated during crash day created worry and distress.

Compassionate acts from fellow survivors, personnel, and active bystanders were greatly important for survivors' well-being and early recovery.

Prehospital care was overall experienced as compassionate and effective, whereas opinions differed regarding the care given upon arrival at hospitals.

Organized psychological support systems appeared relatively rigid and included ad hoc solutions, making them sufficient for some but dissatisfactory for others. Follow-up was good but sporadic, and no one had an overview of the survivors.

Negative and positive consequences can be long-term, which highlights a need for thorough follow-up of survivors after major RTCs.

# Clinical implications

Knowledge on initial reactions and behavior among survivors could make the professional response more efficient and beneficial for survivors. Survivors could participate in preventing and minimizing physical injuries for themselves and fellow survivors.

Negative mental health effects can be prevented and minimized, and ad hoc solutions avoided, through a well-organized and structured social support system. Sustainable and long-term support through connectedness can be facilitated and promoted from the outset: at the crash site, in the emergency room, at health care centers, in hospitals, and later in municipality support groups.

There is a need for increased awareness of the importance of compassion in all medical activities and the basics of compassionate care can be incorporated in relevant medical education. Once an understanding of its importance has been reached, it ought to be feasible to provide compassionate care after major incidents.

Flexibility in formal psychological support ought to be increased, for example with attainable information to all survivors and significant others about expected short- and long-term health consequences and when and where to seek professional help. It is essential to agree on clear guidelines on how the active follow-up over time ought to be conducted.

In line with seeing RTC survivor as a whole person with various but connected needs, a viable option for those with significant difficulties could be group rehabilitation. A rehabilitation team could be multidisciplinary, consisting of a physician, nurse, psychologist, physiotherapist, occupational therapist, and a coordinator. The program could be based on individual and group meetings where survivors (and their families) can be helped through interventions such as facts and information, group cognitive behavioral therapy, and the inherent connectedness of participation. Similar programs are already in place within rehabilitation of conditions such as pain- and stress-related unhealth.

# Future research

There is value in conducting further experience-based, multidisciplinary, and mixed methods research within the disaster medicine research field. It could fill existing knowledge gaps, for example regarding initial social interactions, and connectedness among survivors. There are still important questions to be answered, for example regarding *how* and *why* social support is beneficial for survivors.

There is a gap in knowledge regarding survivors' significant others' experiences as well as the experiences of active bystanders who are first on-site. What are their experiences of encounters with care and support, and what are the consequences in their lives after a major incident?

It would be of interest to further study in what ways the experienced lack of compassion during treatments, encounters, and care affect subsequent recovery and mental health for major incident survivors.

The "sense of coherence" components are highly visible among the bus crash survivors and it would be of interest to study this further by testing survivors' sense of coherence and compare to short- and long-term recovery and health.

Multidisciplinary rehabilitation groups for survivors of major RTCs is an aspect worth exploring further.

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