To target prevention and support the management of occupational risk

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ABSTRACT

The prevention of occupationally related trauma and disease requires reliable measurement systems in order to target the relevant exposures and injury problems and prioritise resources. Social and workers’ compensation insurance data, with exposure, coverage, accident process, medical severity and other outcome information, represents the most credible basis for decisions on preventative action.

The registration and measurement system for occupational trauma and disease, based on the ACC New Zealand paradigm, has been developed by the Swedish Labour Market Insurances, and is also the basis for the new EU occupational injury registration system.

Some different target areas for occupational injury prevention, and examples of successful intervention activities, are reported from Swedish and Australian systems.

To support the industrial management of safety requires good and industry-relevant measurement systems for occupational risk and the consequences of occupational trauma and disease. The development of such specific recording and measurement systems in Swedish branches of industry is based on union-employer consensus about occupational risk and a joint approach to safety management. Aggregate statistical information is of limited use for applied prevention; the accident and injury data must be more specific and detailed in order to be turned into credible decision support systems (DSS).

Some different examples of industry-based safety management and decision support systems from Sweden are presented.

Results from a study on the relation between best-of-sector industrial safety management and shareholder value on the ASX are also presented.
1 Background

Working conditions have improved greatly in the industrialised world since Bernardo Ramazzini laid down the foundations of occupational epidemiology in his "De morbis artificum diatriba", published in 1713.

Ramazzini described, in detail and with convincing breadth, the way in which different kinds of hazardous exposures are systematically related to activities and tasks in different occupations and trades. He showed how specific exposures produce certain adverse health effects and why some tasks and occupations are more likely than others to be associated with injured or crippled workers.

The philosophical importance of Ramazzini’s ground-breaking work can hardly be over-estimated. All development in the area of occupational health since has been undertaken against the background of the unequal distribution of hazards at work, and in conscious appreciation of the priorities of exposure.

Government regulation and inspection activities have been aimed primarily at controlling exposures associated with high a risk of fatality or a persistent incidence of severe medical consequences and impairment, ie. to limit the excesses in the industrial use of labour.

From technical control to judicial compliance

The shift in emphasis marked by the demands of the increasingly complex and technologically advanced natural resources and process manufacturing industries, in combination with emerging restrictions on public and tax-funded resources during the 1970's, resulted in the substitute of piecemeal control and prescriptive regulation for more general and systemic regulatory principles. The oil and gas exploration in the North Sea had a strong influence on Scandinavia and northern Europe in this respect, and the 1972 Robens report spelt a new regulatory regime for Britain. The 1970 Occupational Safety and Health Act (OSHA) of the USA authorizes the administration to employ prescriptive standards to reduce specific hazards to workers, but the fast pace of technological change has made its 'general duty clause' increasingly important (Rasmussen, 1997).

The role of the government workplace regulator has thus shifted from being the technically prescriptive overseer of risk exposures to being the representative of judicial and organisational competence in the area of safety management. The move from technical to administrative competence was also reflected in the recruitment policies of the relevant government agencies, and compliance control from the 1970's onwards has been exercised under the general principles of "duty of care" in most areas of industry.
While government thus clearly has withdrawn from its earlier detail-regulating, interventionist approach many of the industrial activities exhibiting an above average propensity for causing injury to workers have been restructured and increasingly tend to be associated with small-size operations, sub-contractors or the self-employed.

Traditional approaches to workplace inspection and control, in the face of a labour market where risk increasingly is being pulverized and spread over large numbers of exceedingly small establishments, are clearly inadequate. Not only are public resources insufficient to maintain a credible presence in a large enough number of workplaces, but the average size of companies means that severe injuries are few and far between in each establishment. Objective performance criteria, in terms of reported trauma and disease and claims for compensation, are difficult to apply to a majority of establishments.

Whether government activities are directed towards control or advice, the indications of where and in relation to what such activities are needed must be established in a reliable fashion and according to a strategy with identified targets and measurable outcomes.

2 Accidents and injuries at work

Our special focus here is the control of risks for occupational accidents and injuries at work. Occupational trauma risks have certain characteristics, which are important to understand and judge correctly when assessing the type of control measures needed.

Occupational accidents and injury risks are

- unevenly distributed over industries,
- unevenly distributed over severity,
- unevenly distributed over costs, and
- perceived as dependent upon behavior.

2.1 Uneven distribution over industries

Occupational risks are extremely skewed in all societies, and the stability with which certain types of work continue to injure and kill at much higher proportions than other types of work, is a source of frustration to the managers of safety and to those involved in prevention.
The fact that seafarers were 100 times more likely to die at work compared to factory workers in the United Kingdom in the period 1884-94 reflected the technology of sea transport in the late 19th century. However, the risks faced today by fishermen in small coastal fishing vessels in many waters around the globe, where the big trawlers have vacuumed the seas for fish and supply is low, are comparable. Thus, technology has changed the risk and economics and politics have changed it again. The great discrepancies between a few occupational groups at very high risks and many occupational groups with low or medium risk levels at work seem to persist.

2.2 Uneven distribution over severity and cost

It is estimated that in Australia 450 men and women die traumatically at work every year, 40,000 become permanently impaired, 200,000 must seek emergency care at hospital due to work injury, and more than 300,000 have to stay home for a period of rehabilitation due to injury at work.
Every system, which exposes humans to trauma risks, has a severity pyramid like Australia’s. The implication of the pyramidal shape is that increasing levels of severity tend to be associated with lower levels of incidence of trauma. However, the type of hazard you are exposed to will define your risk of dying. Road trauma include a high proportion of fatalities, accidents to football players are less likely to be fatal.

Medical severity is unevenly distributed and so are the economic consequences of injuries at work. If all lost-time injuries in a company are recorded, the majority of accidents only lead to minor consequences.

This is illustrated by the cost of all 146 known injuries in 19 Swedish furniture companies over one year. The proportion of the total injury cost, which is picked up by the company in this system is very small. Naturally, this will vary between different countries and be dependent upon how tax, insurance, social welfare and regulatory systems are structured.

2.3 Dependent upon behaviour

Maybe the most unique characteristic of occupational accidents is that they are perceived – by most of us – as dependent upon the behaviour of the victim. Unlike other hazards around us, the risk of meeting with an accident, i.e. to suddenly become involved in an unplanned and unforeseen process of events leading to injury, we tend to regard as determined by what we did, how we did it and that we failed in our intended behaviour and lost control.
The risk of traumatic injury at work is closely associated with the physical interaction between man and machine, between the human body and tools, equipment and loads. Instinctively, we like to regard the individual as being in command of the physical process of the work tasks he/she performs, and we tend to see the accidental loss of control of the work process as an indication of failure on the part of the worker, the victim.

It is also quite clear that accidental injury is a very different safety problem compared to more abstract risks, over which the individual is seen to exercise far less control.

Accidental processes leading to injury represent concrete and apparent risks and are also seen as controlled by the behaviour, the skills and the competencies of the exposed individual. This is in contrast to other prominent risks in the work environment, e.g. chemicals or other hazardous substances, which might be both concrete and prominent risk exposures, but which are seen as external to the behaviour of the exposed. Most workers on a construction site will view exposure to hazardous substances at work as a more prominent risk than meeting with an accident.

More abstract risks or risks where the consequences might be uncertain or hard to envisage are the hardest to manage. And any control measures or prevention activities adopted in the management of safety must be adapted to the characteristics of the risk in order to be effective.
3 To Manage You Must Measure

Occupational health and safety, and the incidence and severity of occupational trauma, is closely associated with the pace and character of industrial development. Technological change in manufacturing, agriculture and transport - modernization and rationalization of production methods, increased trade and production for export markets, increased investment in a skilled workforce and improved methods for systematic quality control - have all generally served to improve the working environment and reduce the exposure to injury risk.

And though it can be argued that technological development drives most of the improvement in the conditions of industrial work, at critical times in this process of modernization policy-makers have relied on measurements of risk provided by different types of safety professionals:

- industrial safety inspectors have played a crucial role in the management of occupational safety from the 1880’s and onwards,
- occupational hygiene and company health care specialists, together with medical specialists in the primary care and regional hospital systems have provided important information in relation to occupational injury and disease,
- the introduction of social and workers’ compensation insurance have provided additional experts in the field of measurement of accidents and injuries related to work.

The growth of the field of industrial safety, particularly among petro-chemical, process and energy companies, where occupational safety has been a secondary outcome of investment motivated by the need to safeguard installations and natural resources, has seen the methods of systematic industrial safety management spread across the globe through the multi-national corporate networks.

3.1 The Safety Managers

In spite of the positive developments in occupational health in the industrialised world, safety remains poorly defined in most systems, modern and developing alike, and the practical responsibility for safety - the responsibility to avoid and prevent accidental injury and to control risk - is often in real terms a responsibility delegated to the risk-exposed worker.

A first step in the process of building systematic safety management is to clarify in practical terms who are the safety managers: To undertake successful safety management we need safety managers.

There are organisations, structures and institutions – public and private – in most systems where the potential safety managers are employed. We suggest that the
safety managers are those professionals and experts working in government departments, at hospitals or medical clinics, in social and workers’ compensation insurances, and in industrial companies, who have close access to systematic information about the negative outcomes of work-related risks in terms of injury incidence, medical severity and other social and economic consequences.

If measurement is an absolute condition for management, then these experts are the safety managers of the industrial society.

4 Strategic Questions and Information Systems

The basic questions for safety management are

Who are at risk? Which are the typical risk occupations?

Where are the risks? What are the typical risk situations?

How are the injuries sustained? Which are the typical accident processes?

To answer these questions, systematic injury information systems must be built, maintained, quality controlled and strategically utilised. A well structured injury information system should be constructed so that it can

- measure risk based on exposure,
- measure injury severity,
- represent epidemiological variables credibly,
- provide longitudinal trend data,
- be used to measure potential effects of interventions.

There are – in principal – three different sources of systematic information about accidents and injuries at work; the type of information sources you need to measure risk systematically.

These information systems are either with the industrial safety inspectorate, at the hospital emergency department, or with the public fund workers’ compensation insurance. These three information systems are built for different purposes, they contain different variables and will generate slightly different information about injury risks.
An example of how the three information sources are related to each other, and what differences there are between them, is this one-year material from the Umeå region in the north of Sweden. In one year a total of 1785 work injuries were identified in the region – with the help of three different data sources: the emergency department, the industrial safety inspectorate and the workers’ compensation insurance.

It is obvious from this study that the different criteria applied in these systems (i.e. acute medical need, notification to the regulator, claim for compensation) generate very different information. Only 7% of the total number of injuries were known to all three systems, and the authors concluded that you would need the information in all three systems in order to correctly assess the full breadth of work-related risks in the region.
One further typical difference between the medical system, based on perceived acute medical severity, and the insurance system, based on claims for earnings-related compensation, is exemplified in this picture. If you hurt your eye you seek medical attention, but if you injure your back you go home (Björnstig & Larsson, 1990).

Let’s take a closer look at the three different types of systematic data sources for safety management:

4.1 The Inspectorate Information

The inspectorate is focused on injury risks to exposed workers, on hazardous activities and on occupations with high injury risks - the practical work of the Inspector is the control of compliance with regulations and hazardous work practices in industrial workplaces. This will define the strategy.

The main restrictions on the effectiveness of the Industrial Safety Inspectorate is the lack of manpower and resources to inspect sites and assess risks before injury is sustained. In many systems, it is difficult to make the translation of information on exposures and hazardous activities into the systematic and efficient detection of non-compliant employers and industrial establishment.

Nevertheless, there is useful information in the Inspectorate systems, as exemplified by this comparison between Inspectorate and Insurance information on risk and inexperience from Sweden:
This is the type of information available to the Inspectorate in many systems: Severe and impairing injuries to wood industry workers by the experience of the victim at the time of injury (Larsson, 1988). Assuming that the influx of newcomers to the industry is roughly even over the year, there is concordance between the information from the Insurance system (on permanent impairment injuries associated with wood-processing machine) and from the Inspectorate (reported accidents with severe consequences).

The risk of sustaining a severe or permanently impairing injury the first day on the job is between 43 and 53 times higher than the same risk after three months on the job. Thus, the procedures for initial introductory training on the job in this industry was shown to be a top priority for injury prevention.

4.2 The Hospital Information

The accident and injury information available from the hospital emergency department is normally rich in information on injury type, diagnosis, medical severity, interventions, treatments, and associated costs, and will also contain background data on age and gender. Potentially, the system contains useful epidemiological information, but tends to be restricted to the medical injury perspective and often lacks details on the accident process, the hazardous exposures and other pre-crash data necessary for prevention (e.g. the occupation of the victim).

This example is from the Victorian Emergency Department Presentation Register in Australia, where there is a potential to identify occupational priorities based on injury type, medical severity and consequence costs. In terms of detailed application and des-aggregated analysis there is still some way to go in realizing the epidemiological and the preventative potential of the hospital information system.
Work related injuries in emergency department presentations (VEMD 1996-2001)

4.3 The Insurance Information

The information in the claims-settling systems of workers' compensation or social insurance have the most extensive coverage of data necessary for the targeting of prevention and the management of safety. These systems cover injury type, diagnosis, medical severity, interventions and treatments, payments and costs.

More importantly, these systems also include extensive information on the pre-crash phase of the injury – the accident – and such systematic information is absolutely necessary for prevention.

The restrictions on insurance-based systems of injury information will be if the scheme is operated on the basis of private insurance, in which case normally only limited information on hazardous exposures and the distribution and priorities of risk will be available for prevention and the management of safety.

The system developed at the Accident Compensation Corporation (ACC) in New Zealand and applied in several Scandinavian jurisdictions has been integrated in the new EU reporting and recording standard. To describe the accident, three questions are included on the report form:
PRE-CRASH INFORMATION (ACCIDENT)

* What was the person doing?
  e.g. ... riding ... bike

* What went wrong?
  e.g. ... slipped ... oil-spill

* How was the injury inflicted?
  e.g. ... hit against ... lamp post

The responses to these questions can be recorded in free-text format or in a condensed verb/noun code.

The EU recording format contains information on the enterprise, the working conditions, the injured employee, the workplace, the sequence of events (the accident) and the injury:

ENTREPRISE
  economic activity, size, location

WORKING CONDITIONS
  working environment

EMPLOYEE
  occupation
  age - gender
  nationality
  occupational status

WORKPLACE
  work process

SEQUENCE OF EVENTS
  - specific physical activity, associated material agent
  - accident mechanism, associated material agent
  - contact/injury mode, associated material agent

VICTIM
  type of injury, body part injured, days lost

The most important information in the insurance system are the details describing the consequences of injury; the consequences of traumatic injury that only the insurance will have systematic information about.

Some of the severity criteria available to the insurance, which can be used to set priorities for prevention are:
• duration of earnings-related compensation (rehabilitation period),
• days admitted as in-patient to hospital (threshold of medical severity),
• degree of permanent impairment (percentage according to medical criteria),
• forced early retirement (disability pension, annuity).

4.4 Insurance Information used for Prevention

Here are a couple of examples of how you can use insurance information to identify the priorities of prevention and link the consequences – economic and medical – to exposure and “pre-crash” information – to the activities and tasks that are associated with injury. The first example is from the coalmines of Australia.

Ex 1

4,369 injuries among underground face workers in New South Wales, where we have distributed severity (measured as compensated days, lump sum impairment payments and medical costs) against agencies inflicting injury:

You can see here that “rail transport”, “handtools, etc”, “conveyors, etc” and “underground roof, rib, side” are the agencies inflicting injury with the highest average severity in terms of long-term absence (measured by the compensation paid), the medical costs incurred and lump sums paid (permanent impairment cases). The agencies identified point to specific counter-measures for control and prevention and the priorities are given in terms of volumes of claims and average – and aggregate – severity.
The second example is from sawmills in Sweden. If the accidents are analysed and clusters of similar accidents are identified in the information system, this is what you can get:

**HIT BY / AGAINST TOOL**

Fracture of arm or leg

Average: 113 days (10 cases)

Average: $25,600 (excl. maim benefits)

Elimination: Guard or switch preventing access to machine before standstill. New disk brakes on the shafts of rotating parts.

Cost: $50,000 for a medium-sized mill

(Söderqvist & Larsson, 1990)

Large rotating machines, like this de-barker, need to be cleaned quite often. This is done with pressurized air. Often operators don’t take the time to let the rotating machine stop – this can take several minutes – but they start cleaning the machine while it is still rotating.

The year of analysis (1988-89), we found 10 identical injury cases of arm or leg fractures associated with this task. The average lost time was 113 days at an average cost of US$25,600 (1989), and the elimination measures were identified as either a guard/switch to prevent access to the machine before standstill, or the retro-fit of disk brakes on the shafts of rotating machine parts. The cost for this was estimated at US$50,000 for a medium-sized mill.

The third example is from the construction industry in Melbourne 1998-2002. The most common severe injury among roof layers is falling off the roof – not surprising, perhaps – but the incidence and severity of this problem was not known before we did this analysis. Not only is this the most common severe injury, it is by far the most expensive and medically demanding of their injuries:
These examples point to the type of knowledge needed to conduct applied prevention. You need to locate, collect, combine and analyse information, and identify the priorities.

But in order to move from theory to practice and intervene and prevent, and then to measure the effects of the intervention, you need to convince industry, exposed workers and statutory authorities about the need to act - and also develop the necessary counter-measures.

5 Applied prevention - some examples

The public fund workers' compensation system represents the most valid and reliable way of identifying occupational risks and severe occupational trauma. If the system is jointly owned and controlled by industry - employers and unions - it seems that applied prevention is more likely to occur, particularly if it operates under a no-fault rule, which also rids the system of expensive litigators.

Consensus decisions on prevention can be directed towards quite practical and applied solutions.

Quarrying & Drilling (Sweden)

Based on the combined figures on accidental falls, musculo-skeletal injury, noise-induced hearing loss, and work-related early retirement among the occupational groups involved in quarrying work, drilling, a development project was launched
by Mining employers and Miners' Union through the Swedish Labour Market Insurances in 1998.

Quarry drilling - before

Jack-hammers and drilling equipment for stone-breaking and the manufacturing of pavers and curb stone represent traditional heavy and ergonomically unsound exposures and this equipment is in need of a drastic upgrade.

A new, ergonomically improved equipment to handle the drill was developed in this industry project. The development of the equipment was funded by Employers and Unions through their Insurance and is available - at cost - to the entire Swedish mining and quarrying industry.
Quarry drilling - after

Multivac (Sweden)

The vacuum packaging machine of the food-processing industries is a well-known amputator of fingers and hands; traditional technology, virtually unbreakable and very long-lasting machines, which will be around for many years still.

Fractures and amputations happen when operators are adjusting the flow of material, when they seek to clear away food or packaging residues and when they are cleaning or setting up the machine for operation (Kullman 1986).

In 1998 the Employers and Unions of the Swedish food industry commissioned a development project on retro-fitting safety features into the most common - and most injury producing - types of packaging machines in the food processing industries, the so called Multivac.

The project resulted in a retro-fittable safety package, costing no more than NZD 6,000.- per machine - representing around 2% of the investment value of a new machine, from the year 2000 made available to the entire Swedish food manufacturing industry.
The typical injuries associated with these machines have virtually disappeared in those plants which have fitted the safety packages to their machines.

Ballarat intervention - transport and nursing (Australia)

On the basis of 25 months claims for workers’ compensation in the state of Victoria, occupational titles, activities associated with injury, and equipment involved in injury were identified and described in terms of medical consequences and severity. The analysis of the claims material was further focused on the greater Ballarat region, a semi-rural district northwest of Melbourne with around 125,000 inhabitants and a varied industrial structure.

In the Ballarat region target areas associated with high proportions of “harm” (severity x frequency) were identified as manual handling operations particularly among transport workers and nursing staff.

The intervention area for the project “Operation Safety” was delineated on the basis of the available media maps for coverage of local radio, newsprint and television, and contained 1,560 establishments in the areas of transport, manufacturing, retail, hospitality and nursing, in all employing 1,350 transport workers, and some 2,400 nursing staff.
The prevention activities in the Ballarat area were co-ordinated with a regional media campaign, and presented an opportunity to combine workplace intervention with media messages directed at raising consciousness and changing attitudes. The campaign was initiated in July 1995 and concluded in June 1996.

The problem-selective and non-punitive approach was considered the most constructive and effective way to attain a potentially measurable reduction in claims. A hands-on and ergonomic approach was also seen as a reasonable way to communicate with, and possibly overcome, the common attitudes "blaming the victim" in relation to causes for overexertion and back injury.

The activities undertaken in relation to local industry during the period were:

- a mail-out to all 305 manufacturing, 951 retail, 110 transport, 183 hospitality and 11 major nursing establishments in the greater Ballarat area, presenting the “Operation Safety” campaign and informing them that they might be contacted over the phone for a visit,

- telephone follow-up, and booking of risk assessment visits with a selected 60 of the establishments,

- risk assessment, focused on manual handling practices and equipment, conducted at 50 industrial sites and 10 nursing establishments,

- a limited number of manual handling problems chosen for further in-depth analysis (eg. design of distribution truck, handling of 44 gallon drums, handling of beer barrels, handling of truck wheels/tyres, improved risk reporting/management system in nursing, etc),

- return visits and collection of attitude survey from a sample of the establishments.

The promotional activities undertaken during the intervention period were:

- a public launch of “Operation Safety” with the responsible Government Minister in Ballarat 23 August 1995,

- outdoor 24-sheet posters in 8 sites around Ballarat from July 1995 until end of February 1996,

- regular Ballarat transit bus decorated as “Operation Safety” bus from September 1995 until the end of June 1996,
• bi-weekly ads in the four local newspapers of the region between October 1995 and January 1996,

• a four times daily, five days a week, one-minute promotion of “Operation Safety” on the local radio station 3BA between 1 November 1995 and 31 January 1996 together with 520 opening and closing credits; during the same period a total of 390 community service announcements in each of the local stations 3BA, 3CV and 3CS,

• the screening, exclusively over the Ballarat region, of three 30-second, specifically produced television spots describing solutions to manual handling and lifting problems in transport (2) and nursing (1) during the period 5 November - 16 December 1995; a total of 1400 target audience (18+) rating points, 300 tarps/week for the two first weeks, 200 tarps/week for the concluding four weeks, a total of 117 screenings,

• during the period 23 August 1995 through 23 May 1996, 43 feature articles in regional newsprint or reports/interviews on local radio (on average once a week) describing local manual handling problems, their solutions and promoting “Operation Safety” initiatives.

An 8 t. vehicle, carrying the “Operation Safety” name, was fitted out as a display truck with a selection of the most up-to-date manual handling equipment. This equipment was borrowed from the manufacturers or agents and included a flexible roller conveyor, a truck-mounted vacuum lift, an overhead hoist, drum handling equipment, trolleys, containers, steps, stairways and ramps, as well as supporting literature and pamphlets.

The display truck was used in November and December 1995 in the industrial areas of the region. An estimated 600 visitors, many of them from the companies contacted, attended the truck display.

Results

Site visits - transport

From the visits to some 50 industrial sites involved in different types of transport activities it became clear that the main issues relating to manual handling, and to the associated slips and falls from vehicles during manual handling, were:

• current truck design makes very little provision for aiding loading and unloading in distribution, which is typically manual with no mechanical aids,
• there is often a lack of adequate provisions at dispatch and receiving points in companies to aid loading/unloading vehicles,
• containerized loads need to be typically loaded (filled) and unloaded (emptied) as individual items manually,
• personnel access provisions to truck cab and load area are typically very poorly designed, inherently unsafe and generate slips and falls from the vehicle.

A major workshop was held on developing ideas for a new model truck design incorporating advanced features for load handling and operator access. This work has led to the new design concept for an urban distribution truck, which includes a containerized load-handling system.

Site visits - nursing

Contributing to the manual handling problem at the 10 nursing facilities was the inadequate design in terms of small room sizes (toilets, bath rooms, etc) forcing nursing staff to carry out patient handling in awkward postures or with restricted assistance hence increasing exposure to injury risk. The conclusions in relation to patient handling in nursing are several and represent the somewhat contradictory picture of a problem strongly associated with reduced staff levels and the economics of care:

• nurses should adopt a "non-lifting policy" achieved through the compulsory use of mechanical lifting and patient transfer devices,
• special training directed at improving the professional skills in relation to patient transfers (eg. manutention) should be applied for all nursing staff,
• the development of in-house programs directed at improving mobilisation of patients, combined with health/fitness programs among staff, should focus on manual handling techniques.
• the development of designated staff for non-medical patient handling would imply that specific professional skills in the physical handling of patients could be developed and overexertion risks decreased.

Survey data

Two independent regional telephone surveys of 1,000 households each, undertaken in December 1995 and December 1996, provide comparative measurements of the underlying occupational injury incidence in the region. Comparing 1996 with 1995;

• occupationally related ill health dropped significantly,
• sprains and strains dropped significantly,
• more people reported lost time injuries in 1996, but the number of "repeaters" had dropped significantly; the overall result was a considerable reduction in the total number of lost time episodes in the region,
• sprains and strains dropped significantly for health workers.
A survey of participating workplaces indicated that half of the companies had initiated activities in relation to manual handling problems after the visit from “Operation Safety”

Claims data

While the injury incidence and severity associated with all claims had increased in the rest of Victoria, there had been a substantial drop in Ballarat. Comparing 93/94 with 95/96 we recorded a **16% increase in claims and severity in the rest of Victoria** while there was an **18% drop in claims and severity for Ballarat**. The difference between Ballarat and the rest of Victoria was statistically significant (Chi-square=33.9; P<0.0001).

The transportation workers recorded a 4% drop in claims in Victoria and a 16% drop in the Ballarat region, even if the absolute regional numbers were small. The nursing staff had increased claims in Victoria by 6%, but recorded a 22% drop in Ballarat.

The total payments associated with severe claims increased by 45% in Victoria and by 28% in Ballarat. If the difference is attributed to Operation Safety, the **regional intervention represented an annual save of around $400,000**.

Conversely, it is projected that a **state-wide intervention along the lines of Operation Safety represents an annual potential containment of payments of claims estimated at around $11.5 million for the State of Victoria**.

Perhaps the most important conclusion from the present project has to do with the dynamics between the themes of applied prevention and the media messages. Television, radio and newsprint messages were built around the problems uncovered by the regional intervention; manual handling problems were acknowledged and addressed locally with the help of constructive problem-solving, and the solutions were often provided by the creative resources of the region.

Decision support for safety management (Sweden)

Finally, I would like to say a few words about Safety Management in the industrial corporation, which we consider to be a special case of Safety Management, but perhaps an area where the methods have developed the furthest.

The perspectives of Industrial Safety Management can be of several different types:
Industrial Safety Management Perspectives

ENERGY - use, storage
HAZARDS - failure modes, technical functions
WORK - job tasks & work processes
SYSTEM - interactions & deviations

PROCESS MANAGEMENT
- risk, change, supply chain, system.

The perspective chosen would depend on the complexity of the production system and the hazards involved. Simple manufacturing without technologically sophisticated processes, with limited amounts of energy stored and used, and with a large number of manual work tasks should be advised to concentrate on safety management systems based on assessments of job tasks, work processes, interactions and deviations.

On a more advanced level, there are some key components to a good and functional Safety Management System in a corporation:

Management of Safety in the Company:
- systematic risk assessment
- control of high risk activity
- preventive maintenance
- the management of change
And, in addition to this, the practical application of the safety management system can depend on if it is proactive or reactive. The assumption of the good safety management system is that risks are identified in a systematic manner – before injury - so that proactive interventions against the identified risks can be made and injury be avoided. If the safety management system is applied bureaucratically or simply to comply with regulations, a reactive approach will assess risk based on injuries alone and thus only intervene once the damage already is done. A reactive safety management system is an example of sub-optimization of resources.

There are proven links between productivity, profitability and good safety management. A few years ago our research centre at Monash was asked by a large Australian merchant bank to develop a survey tool for OHS & safety management performance and to survey the 150 largest companies on the Australian stock exchange.
We rated the companies on their Safety Management Systems and Performance and this rating was used by the portfolio manager at the bank to put together a “best of sector” share investment fund based on 51 companies. To test the performance of the portfolio it was "back-tracked", i.e. tested in theory retrospectively over the last 12 years, with the caveat that such testing only include the companies who have survived, which must be taken into account when judging the outcome:

(Larsson et al 2005)

This test indicated that the companies in the OSH Good Performance Portfolio performed 40% better than the stock-market average over 12 years.

The conclusion is that good safety managers are good managers and the companies which are managed well perform overall better than average.

6 Conclusions

In this lecture, I have tried to make you ask yourselves the question: “How can I improve Safety Management in my professional area?” If you are working in government as an

- industrial safety inspector,
- social insurance officer,
- medical officer,
- taxation officer,
- environmental pollution inspector,
- statistics officer

you are probably in a position were you have access to important information which can be structured and applied for safety management and prevention.

The same applies if you are a medical or science professional working in the health care system, in emergency care or in local clinics; or if you are working in the workers’ compensation insurance as a claims, medical or statistics officer; or if you are a safety professional employed by industrial corporations.

Practical safety management systems are built by competent and laterally thinking professionals in all the institutions above – in cooperation.

The developing society needs to maintain good systems for inspection and control -- to uphold the law and improve working standards. But it also needs to work hard in targeted and applied occupational injury prevention as the pace of industrial development increases.
Please remember that occupational health and safety exists in an area of partial market failure. There is a great need for improved occupational health and safety in some areas of work, but a patchy demand for this in the market. Occupational health and safety is first and foremost a question of public health, and as such it will remain an important public responsibility.
References:


Further references and contacts:

Safety Science Monitor
International Expert Network on Occupational Accident & Trauma Prevention
[www.workingonsafety.net](http://www.workingonsafety.net)