Increasing knowledge of the physical composition of smoke and its chemical properties has broadened the understanding of the causes of asphyxiation. Cyanide poisoning is now understood to be a major cause of death in addition to carbon monoxide (Jones 1987), accompanying the increased use of synthetic materials in building and decorating and the proliferation of plastics in home and industry (Decker and Garcia-Cantu, 1986). In 1991, Baud reported that plasma lactate concentration at the time of admission correlated more closely with blood cyanide intoxication than with blood carbon monoxide concentration.

The use of hyperbaric oxygenation in treating patients with thermal injury has become popular and at the same time controversial. Those who believe that hyperbaric treatment enhances removal of carboxyhemoglobin and promotes tissue oxygenation advocate its use with burn patients. Others feel the cost and clinical risk is too great to justify transporting a thermally injured patient back and forth from the treatment chamber (Ellenhorn and Barceloux, 1988). In the report of a comparative study of recipients and non-recipients of hyperbaric oxygen in burn treatment, investigators reported a 39% decrease in surgical procedures, a 34% reduction in hospitalization and a 34% reduction in patient costs in the cohort receiving such treatment (Cianci et al, 1990). The study did not resolve whether the risk of transporting a patient to and from a hyperbaric chamber was justified.

Recent research has focused on pathophysiological changes in the lung as a consequence of smoke and heat, singly or in combination (Thom, 1989; Demling et al, 1992; Hales et al, 1991; Isago et al, 1991; Kramer et al, 1989). Researchers continue to explore the effect of inhalation injury on microvasculature permeability at the cellular level. It is still difficult to predict the fluid requirements of patients with inhalation injury. More recent work suggests that such injury requires additional fluid administration in the early post-injury phase (Thom, 1989). Further research to identify such fluid requirements is crucial, since contemporary resuscitation formulas do not meet the needs of those experiencing respiratory compromise (Navar et al, 1985; Herndon, 1986; Clark & Nieman, 1988; Haponik & Munster, 1990).

Rehabilitation

The burn treatment community's growing consensus is that the frontier of survival in burn care has been pushed close to its extreme, with the exception of respiratory injury, and that attention must increasingly be devoted to burn rehabilitation. (Helm, 1992; Salisbury, 1992)

Controlling contracture and hypertrophic tissue formation, restoring psychological balance and regaining functional capacity are major clinical goals in the rehabilitation of the burn patient. Helm (1992) has identified the major components of rehabilitation services and listed ten broad educational, research and public policy goals related to burn rehabilitation. The psychosocial aspect of rehabilitation has long been and continues to be a major concern (Bowden et al, 1979; Blakeney, 1988). Current goals extend beyond getting the patient out of the hospital, to embrace the return of the patient to work or school through work hardening, or school reentry programs, provided directly by burn team members or through consultation with community agencies. Obtaining disability insurance for disabled burn patients has been a vexing problem (Salisbury, 1992). Miller et al (1993) estimate 15% of hospitalized burn patients and 1% of those treated in emergency departments experience permanent decreases in earning power.

Recent advances in scar control include the use of silicone and elastomer inserts and conformers in areas where it is difficult to maintain pressure over hypertrophic tissue (Cohen et al, 1989; Pegg, 1989; Ward, 1991). Splinting material, used to reduce contracture formation and allow better control of the treated area, is now available in a reusable fashion that can be customized as a patient's needs change with reduced edema and changing skin coverage. The newer material is easier to clean and has a longer shelf life, thus reducing costs (Roberts et al, 1991).

Conclusion

The past ten years have brought advances in burn care including the identification of toxic substances at the scene of the injury, improved transportation of patients, early respiratory treatment and support, aggressive wound coverage, and more comprehensive rehabilitation services.

Today, those who survive serious injury do so because of knowledge gained from the unfortunate incidents of the past, technological advance, improved health care education, the maturing functioning of multi-disciplinary burn teams and society's ever-expanding demand for quality care. These improvements have a two-way impact on costs, the net effect of which is not clear. As those who ultimately expire from their injuries without recovering survive for longer periods, treatment costs increase. As the caliber and speed of recovery increases for those who do survive, the total hospitalization costs may go down, although more resources are concentrated on

each day of care. Fire and burn deaths have decreased significantly in the past two decades. Now that well over 90% of burn center admissions survive to be discharged from the hospital, hopefully, the balance is shifting toward reducing costs. Better knowledge of this balance is needed to provide substance to the increasing ethical debate over the provision of extensive, intensive care to those who are massively burned (Kliever, 1989; Fratianne, 1992).

4. SUMMARY OF CONFERENCE ON TRENDS IN BURN TREATMENT AND THEIR IMPACT ON COSTS AND OUTCOMES, APRIL 15, 1993

This chapter reports on a conference held to discuss burn care trends and impacts. Various burn care professionals and other experts attended. Figure 6 identifies them. The conference, moderated by NPSRI, was held at the Urban Institute.

James Hoebel, Acting Associate Director for Health Sciences of the U.S. Consumer Product Safety Commission, placed the conference in the context of the legislative history of the fire-safe cigarette. Although CPSC does not have general regulatory jurisdiction over tobacco products, it does have a project-specific charge, mandated in the Fire-Safe Cigarette Act of 1990, to review the societal costs of fires started by cigarettes and the potential economic impact of a cigarette with a reduced propensity to start fires.

Ted Miller, PhD, of the National Public Services Research Institute, Principal Investigator, noted that the conference of burn experts was one of several tasks to be carried out as part of the NPSRI contract with CPSC, others including case studies of fire survivors, an analysis of jury verdict awards, and an extensive data review.

Severity and Nature of Patients with Burn and Anoxia Injuries, with Special Reference to Injuries in Cigarette Fires

A. Fire Data Perspective. (John Hall, PhD., National Fire Protection Association)

Dr. Hall reported that national civilian fire deaths had dropped in 1991 to 4465 after remaining at a plateau of about 5000 for several years, according to data collected annually from fire departments by NFPA. An increasing proportion of fire deaths is attributed to smoke inhalation rather than burns, although the relative importance of the two is frequently obscured by conflicting requirements in injury and death reports as to whether one or more causes can be listed.

About 1200 fire deaths in 1990 resulted from fires started by smoking materials. Most occurred in rooms other than where the fire originated. Of 30,000 fire injuries reported to fire departments 3100 were attributed to smoking. Of the latter, 2300 had burn and or smoke inhalation injuries, the remainder unknown or other injuries. About 1700 of the 2300 were transported to hospitals. There was discussion of the limitations of body part burned as an

indicator of burn severity, since burns to small areas such as the hand frequently result in long-term disability.

B. Burn Data Perspective (Peter Brigham, Burn Foundation)

Mr. Brigham reported that over the past 10 years burn center admissions had been increasing slightly while burn admissions to general hospitals (as reported in the annual sample study of the National Center for Health Statistics) had decreased sharply. The net result was that the nation's approximately 140 burn centers were now admitting about 40% of all hospitalized burns. Factors reducing overall burn admissions and shifting admissions to burn centers were identified, including changing financial incentives, the shift from inpatient to outpatient care, reduced incidence of serious burn injury and concerns about litigation.

Drawing from data collected between 1987 and 1990 at five burn centers coordinated by the Burn Foundation, Mr. Brigham noted that 85 admissions, or 2.5% of all admissions had been attributed to fires started by dropped cigarettes. Based on a projection of a subsequent review of Philadelphia Fire Marshal records on patients whose injury cause was recorded in the medical record only as "house fire", there were an additional 25 regional admissions resulting from smoking fires. The estimated total of 110 admissions from smoking fires results in an overall proportion of 3% of burn center admissions. Since the Burn Foundation hospitals account for about 5% of the nation's 23,000 burn center admissions, smoking fire injuries as the same proportion of national burn center admissions would be about 700 per year. While not a true sample, this figure does not contradict the NFPA report that 1700 people known to have suffered burn or respiratory injury in fires started by cigarettes were transported to hospitals.

Mr. Brigham reported some preliminary data. Average cost per day for known cigarette fire victims treated in Burn Foundation centers was $2465, based on adjustment of charges to each hospital's annual Medicare report cost-to-charge ratio and for inflation to November, 1992. Mr. Brigham stressed distinguishing costs from charges, which are increasingly inflated to capture revenues from sources which continue to pay a high proportion of charges. The average length of stay for this cohort was 33.5 days, resulting in hospital costs of $82,977. At $83,000 per admission, national burn center costs alone would be $60 million per year. This excludes physician charges, prehospital and referring hospital care, post-discharge care, and the costs of pain and suffering as reflected in jury awards. The mortality rate for this group of patients was 28%, well above the overall 7.2% mortality rate for these burn centers during 1987-1990.

C. A Federal Data Perspective (Ted Miller, PhD, National Public Services Research Institute).

Dr. Miller referred to data collected from the National Electronic Injury Surveillance System (NEISS), the National Health Interview Survey, the National Hospital Discharge Survey and the National Medical Expenditure Survey. Outpatient visits per hospitalized burn injury (2.2 in NMES data) seemed low to the burn experts. Miller also was encouraged to check the NEISS hospitalized burn distribution against the cause-coded California Hospital Discharge Survey distribution and against burn center data.

Trends in Burn Treatment

A. Transportation and Emergency Department Treatment (Alan Dimick, MD, University of Alabama)

Dr. Dimick described the six components of a properly functioning emergency medical system, as was now generally available throughout the country. He described the training to emergency care providers available in Advanced Burn Life Support courses offered around the country. He expressed concern that the improved survival rates resulting from well-managed and appropriate triage to burn centers may not prevail in the new world of managed care systems and HMO Preferred Provider Organizations. There could be an adverse impact both on patients and their families if the patient must be transferred to a participating hospital without a burn center, where there is no team approach to burn care.

B. A 40-year review of burn mortality. (Arthur D. Mason, MD, US Army Institute of Surgical Research)

Dr. Mason reviewed changes in burn mortality at his institution and nationally since the establishment of the burn center at the USAISR in 1947. The LA50 (the area of the body burned above which 50% of all patients do not survive) had increased nationally from 45% in the 1960's to about 75% overall and above 80% for young adults. Survival is continuing to improve except for patients with severe inhalation injuries. The emphasis in both research and treatment thus should be increasingly devoted to rehabilitation. In discussion it was noted that the mortality rate in most burn centers is now below 5%. Every burn center has its cluster of massively burned patients but most are below 25% body surface area. In the massively burned, long-term quality of life cannot be predicted from the size of the injury: much depends on personal motivation and

family support. While the literature is inconclusive, it appears that 80% of the massively burned resume independent existence, but less than 50% regain a healthy sense of self-worth. Thus if long-term care, especially of a mental health nature, is adequately reimbursed under proposed health care reforms, the costs may exceed those of acute care.

C. Inhalation Injury (William Clark, M.D., State University of New York at Syracuse)

Dr. Clark reviewed the development of an understanding of inhalation injury, citing knowledge gained from several major disasters and from animal studies. He described the deficiencies in defining and diagnosing inhalation injury, noting that the descriptive methodology is problematical, the clinical consequences not always obvious and the responses to exposure inconsistent in animal models.

Inhalation injury increases the likelihood of death by anywhere from 15% to 40%, in different institutional studies.

Dr. Clark's conclusion that it is not currently possible to quantify the severity of inhalation injury or its comparative importance to burn injury in mortality led to an extended discussion of such classifications. The restriction in death certificate E-coding to one cause (burn or inhalation injury) obscures the interaction between the two which frequently results in fatal pneumonia. Carboxyhemoglobin levels are not a good indicator since they have frequently dropped by the time a measurement is taken. More recent efforts to measure fractional accepted dose have not yet proven valid.

Dr. Warden noted that current treatment focuses on symptoms (e.g., improving ventilation) rather than the underlying disease. The future lies in addressing the inflammatory reaction (e.g., through monoclonal antibodies). Dr. Mason noted that inhalation injury is essentially a chemical burn of the trachea which cannot be reversed. Though its management can be improved, it has to slough and clean on its own.

D. Wound Management (Cleon Goodwin, MD, Cornell-New York Medical Center)

Dr. Goodwin cited trends including earlier excision and a move from mesh to sheet graft. Cultured epithelial autograft (CEA) is now frequently used in massive injury when there is little available donor skin (generally, 90% of body surface area burned). It has been somewhat prematurely commercialized, being used in patients with relatively small injuries. CEA is usually unsuccessful when applied over deep wounds without dermal support. Management of wounds

covered by CEA is so difficult that some patients cannot be referred to rehabilitation centers. CEA is expensive, currently $400 per 25 square centimeters.

A variety of protein-based items are currently being tested to provide dermal support in wound healing. A product expected on the market in 1988 is still not out. Ultimately, perhaps within five to ten years, morbidity will improve, but currently there is much scarring.

E. Infection/Immunology (Glenn Warden, MD, Shriners Burns Institute, Cincinnati, Ohio)

Dr. Warden described the strong interrelationship among nutrition, metabolism and immunology in treating the severely burned patient. He described the sequence of injury response involving first local and then systemic inflammation followed by shock and frequently a systemic infection. There is currently a focus on inflammatory mediators (cytokines and growth factors) in an effort to reduce their immunosuppressive effect while still controlling infection.

Future trends include the development of vaccines, Polymyxin B and antisera, including monoclonal antibodies (which can cost up to $1,000 a day) and immunoglobulins, such as growth factors and blockers. Their development is controlled by industry. Growth factors reduce the time needed between surgical procedures, at the possible expense of optimum long-term result. Further progress is needed against infection without compromising the immune response.

F. Rehabilitation (G. Fred Cromes, PhD, University of Texas Southwestern Medical Center, Dallas)

Dr. Cromes described the program at Parkland Hospital and the University of Texas Medical Center in Dallas. He cited the relationship between increased survival of large injuries and longer more complex rehabilitative care. Burn rehabilitation services have improved over the past decade such that most burn centers with 120 or more admissions per year have well organized services and strong patient followup. There is a need to study long-term outcomes, empirically evaluate rehabilitation treatment and provide more outpatient care directly or under the supervision of the burn center team. Length of time in rehabilitation correlates with size of injury in large burns but not in small injuries (e.g., serious hand burns).

Costs are increasing as a result of litigation and disability payments. Workers' Compensation insurers are seeking to avoid the responsibility of paying for injuries incurred through employee negligence. Medical insurance companies are declining claims for pressure garments and related visits, as "cosmetic" care. Patients generally suffer an "adjustment disorder" akin to post-traumatic stress.

Collection rates vary widely for both acute and rehabilitative care. Hospitals are generally covering between 60% and 80% of charges, while physicians' collection rates were cited as ranging from 13% to 60%.

The National Institute of Disability Rehabilitation Research (NIDRR) is currently reviewing applications for grants that will be made to three model burn rehabilitation centers. It is hoped that such federal funding will spread to additional centers throughout the country as has been the case for spinal cord injury.

G. Burn Unit Operational/Financial Issues (Marion Jordan, MD, Washington Hospital Center)

Dr. Jordan reviewed the evolution of burn centers, which proliferated in the specialized unit era of the 1970's. While some burn units are doing well financially, many are not. Generally designed to treat major burn injuries and featuring expensive capital equipment, such centers were now having to adjust to treat larger numbers of smaller injuries. Burn centers need a mix of small and large burns to operate effectively. Maintaining specialized staff in the face of census demands which vary by season is challenging. By treating more of the smaller injuries, census levels become less sensitive to the occasional arrival and departure of massively burned patients.

Since surgeons are trained to treat small burns, payer source may influence decisions to refer a burn patient. Problematically, that means burn centers receive disproportionate numbers of charity care cases among the patients referred with smaller burns. Community hospital physicians also occasionally take too long to decide what to do with a burn patient, resulting in a poorer graft take for retained patients.

The overall threat to burn centers of reduced reimbursement was discussed. There was a reference to a drop in burn service listings in the American Burn Association directory, and the relative contribution to this phenomenon of reduced burn admissions, stricter listing criteria and increased reluctance to be identified as a specialized burn care facility.

The question was raised whether increased referrals to burn centers would ultimately increase or reduce overall costs. Respondents stressed the need to treat large numbers of relatively small burns in burn centers. This would both result in quicker and cheaper rehabilitation of those small burns, and enable the burn center to maintain their efficiency of operation, and thereby their availability for treating larger burns.

Figure 6. List of Burn Injury Conference Attendees

John Hall, Jr., Ph.D.
National Fire Protection Association

Bea Harwood
U.S. Consumer Product Safety Commission

John Ottoson
U.S. Fire Administration

Dale Ray
U.S. Consumer Product Safety Commission

Joseph Rees
National Coalition of Burn Center Hospitals

Ruth Schultz, RN, MPH
National Center for Injury Prevention and Control, Centers for Disease Control and Prevention

Lee van Lenten, MD
Biophysics and Physiological Sciences, National Institute of General Medical Services, NIH

William Zamula
U.S. Consumer Product Safety Commission

William R. Clark, MD
SUNY Health Science Center

G. Fred Cromes, PhD
University of Texas SW Medical Center at Dallas

Alan Dimick, MD
University of Alabama Hospital

Cleon Goodwin, MD
Cornell-New York Medical Center

John Heggers, PhD
Shriners Burn Institute

Claudella Jones, RN
National Institute of Burn Medicine

Marion Jordan, MD
Washington Hospital Center

Arthur D. Mason, MD
U.S. Army Institute of Surgical Research

Gwendolyn Smith, RN
Crozier-Chester Medical Center

Glenn Warden, MD
Shriners Burn Institute

Peter Brigham, MSW
Burn Foundation

Ted Miller, PhD
National Public Services Research Institute

Patricia Smith-Regojo, RN
Saint Agnes Medical Center

Nancy M. Pindus, MBA
The Urban Institute

5. BURN INJURY JURY VERDICT ANALYSIS

This chapter estimates the monetary value of pain and suffering associated with nonfatal burn and anoxia injuries. Despite its name, juries typically also include compensation for lost quality of life in this category. The theoretical framework for this estimation procedure can be found in Cohen (1988), Viscusi (1987) and Rodgers (1989, 1992). The basic nation is that pain and suffering to a survivor can be approximated by the difference between the amount of compensatory damages awarded by a jury minus the actual out-of-pocket charges associated with the injury.

Table 15 provides some basic summary statistics on the cases received from Jury Verdict Research, Inc. (JVR) and some comparative statistics on burn survivors discharged from California hospitals. To ease comparisons, the percentages shown in this table are percentages of cases with known values, except that the unknowns are a percentage of all cases. The JVR data include 606 survivors of burn or fire-related injuries; 397 of these survivors were successful in bringing private lawsuits against negligent parties who were in some way responsible for the injury. The remaining 209 burn victims settled their claims with a monetary out-of-court settlement.

Comparing JVR and California hospital data shows those experiencing flame or electrical burns were more likely to sue than those experiencing scald burns. This difference probably results from both greater burn severity and a greater likelihood of finding someone to sue (notably, electric companies and suppliers of products that contain accelerants, like propane tanks and cigarette lighters). Trial dates range from 1979 to 1992, with all dollar figures update to 1992 dollars. The age and sex distributions of the two groups of survivors are similar. Predictably, the JVR data are for more serious burns than the average, probably more typical of burn center cases. The JVR data often do not state the cause of house fires. A typical suit might charge a landlord with contributory fire code violations. The data do include a few fires explicitly caused by cigarettes.

Table 16 summarizes the data on monetary losses and awards. The jury verdict analysis excludes punitive damages and damages to third parties, for example, due to loss of consortium. Not all cases have information on past or future losses. Generally, the JVR case summary indicates past losses and breaks out past wage losses, past medical expenses, future wage losses, future medical expenses, and in a few cases past property damage. Table 16 averages losses only

over those cases where such losses were indicated. For example, among 397 jury verdict summaries, 177 indicated past medical losses. The average medical charges for those 177 cases were high -- $100,308 (in 1992 dollars). This mean, however, is below the $124,735 burn center mean hospital plus physician charges for flame burns, and the burn center charges ranged higher. The JVR mean also is below the $119,772 California hospital mean for flame burn plus anoxia injuries, but well above the $46,493 average for all hospitalized flame burn survivors. Thus, the JVR cases appear to be reasonably typical serious burns.

Pain and suffering was estimated in all cases where JVR indicated some past or future losses. It is possible that JVR excluded some losses in these cases, in which case pain and suffering is overestimated. However, in cases where medical charges were reported, for example, it was impossible to distinguish whether wage losses were really zero or simply unreported.

Past and future loss estimates are primarily losses reported by the plaintiff. Since these estimates may be inflated for purposes of litigation, and may be disputed by the defendant, they may be an overestimate of actual out-of-pocket losses. To the extent that JVR reported losses are an overestimate of actual out-of-pocket losses, the pain and suffering estimates are likely to be underestimated. If out-of-pocket losses are overstated, the defendant is likely to raise this issue at trial and juries are likely to discount the losses. Thus, by subtracting out the full reported loss, too much was subtracted from compensatory damages when estimating pain and suffering.

Many states have contributory negligence rules that require a reduction in the actual award to account for the percentage of plaintiff negligence. Table 16 does not reduce the award to account for contributory negligence. To do so would dramatically and incorrectly decrease the pain and suffering estimates in many instances. Data on reductions in awards for contributory negligence were coded but not analyzed here.

Since many of the cases did not report past or future losses, NPSRI attempted to estimate these out-of-pocket losses in both jury award cases and private settlements with sufficient information on the nature of injury. This attempt used the cases with actual losses reported to estimate the functional relationship between injury characteristics and total monetary losses. Out of the 282 cases with past loss estimates (195 jury awards and 87 settlements), sufficient data were available to yield a sample size of 241 cases. Table 17 shows the resulting regression model. The model was quite successful in estimating past losses, explaining about 40% of the variance in the natural log of past losses. The most significant variable was percentage of body

burned. Other explanatory variables of importance were third degree burns, emotional trauma, amputations, and various other physical injuries that accompanied the burns.

The estimated coefficients in Table 17 were used to predict past losses for cases lacking past loss data. The regression equations estimating pain and suffering were estimated both with and without these additional cases. Table 18 estimates pain and suffering using only those cases where JVR included past losses. It is based on a sample of 165 jury award cases out of the 195 cases reported that contained past loss estimates. The remaining 30 cases were excluded primarily due to misswing information about the independent variables used in the regression. One extreme outlier was excluded after analysis of residuals. Table 19 provides an identical model using only past medical losses instead of past wage and medical losses. Table 20 provides the same model with the full set of cases - including those where losses were estimated using the procedure described above. It is based on a sample of 298 jury award cases out of 384 cases reported. The remaining 86 cases were excluded primarily due to inadequate information, and in a few cases, due to residual analysis that indicated they were extreme outliers.

Tables 18-20 indicate some success in modeling pain and suffering, with 50-60% of the variance being explained. In addition to explanatory variables for pain and suffering such as out-of-pocket charges, degree of burn and percentage of body burned, the analysis attempted to control for factors external to actual pain and suffering that might affect the jury award, such as type of liability, responsible party, and presence of plaintiff negligence.

Two major caveats apply to this analysis. First, Viscusi (1988) recommends a Tobit analysis for estimating pain and suffering, due to the fact that some jury awards are for an amount less than out-of-pocket expenses. However, the four cases where this was true in the JVR data did not ultimately end up in the sample because of missing information about the independent variables. Thus, Tables 18 through 20 use ordinary least squares to estimate pain and suffering.

Second, the cases used in this analysis are not necessarily representative of the distribution of fires or fire injuries in the U.S., nor injuries caused by cigarette fires. Indeed, it would be coincidental to find that they match the distribution of fires in the population. Instead, the jury award cases are used here to estimate the functional relationship between physical damages (e.g., lost wages, medical charges and severity of burns) and the "pain and suffering" component of jury awards. Once this functional relationship is estimated, pain and suffering can be estimated for any distribution of fire-related injuries. The estimates will be most reliable for victims like

hospitalized cigarette fire victims whose medical losses are of the same order of magnitude as the losses in the JVR data.

Although nothing is known about how representative these cases are of burn survivors who sue and recover damages in a jury trial for injuries, information received from JVR indicates that their database currently represents about 40% of jury verdicts in the U.S. (To control for the fact that they have been increasing their coverage over the past few years, a trend variable was included in the regression equations reported here. This variable was not significant.)

Comparison with Prior CPSC Estimates

The pain and suffering equation estimated in Table 20 can be compared to the equation in CPSC's Injury Cost Model (ICM), as reported in Rodgers (1992, Table 4). One of the most direct comparisons is the relationship between "specials" (medical charges and wage losses) and pain and suffering. The ICM estimated coefficient on the natural log of "specials" is between 0.478 and 0.526, while Tables 18 and 20 indicate a coefficient of 0.43 to 0.45. With standard errors of 0.073 and 0.035 respectively, the coefficients estimated here are virtually indistinguishable from those estimated by Rodgers. Also, age and gender have no explanatory power in either model.

Another way to compare the ICM estimates to those derived here is to calculate the predicted pain and suffering for a typical burn case using both models. This was done by multiplying the regression coefficients times the mean values of the variables reported in Table 20, then summing the products. This yields an estimated pain and suffering value of $458,090 ($577,258 if the Table 18 coefficients are used instead and $535,033 with the Table 19 coefficients and mean medical losses). Using the mean values for flame burns only, the comparable coefficients are $688,010, $901,341, and $759,552 respectively. The regression using medical losses only (Table 19) consistently falls in the mid-range of the two regressions that consider medical and productivity losses.

In order to obtain comparable estimates using the ICM coefficients, a few additional calculations had to be made. For example, the proportion of category 3 and category 4 injuries were estimated directly from the JVR data, by examining the percentage of body burned. Using the mean values from Table 20, the ICM yields a pain and suffering estimate of $1.1 million.

The difference in estimates seems smaller when viewed in natural logs. The ICM model yields an estimate of 13.9 versus 13.2-13.3 from the JVR model.

One possible reason why the results obtained here produce lower pain and suffering estimates than those generated by the ICM is that the typical burn case represented in Table 20 is considerably more severe than the typical consumer product injury case used to generate the ICM estimates (which include many types of injuries other than burns). According to Rodgers (1922, Table 2), the average "specials" for consumer product injury jury awards used to generate the pain and suffering estimates was only $16,804. Only 7.6% of the cases analyzed had specials of over $50,000, with average specials for those cases of only $101,640. In contrast, the average specials reported for the 298 burn injury cases used to generate the estimates shown in Table 20 was $183,505. Since only a handful of cases used to estimate the ICM model had specials this high, the ICM regression equation may have been less accurate at these extreme values. The differences, however, also appear even larger when compared at $16,804 mean. There the ICM estimates pain and suffering at $348,000, compared to $158,388 to $206,504 with the burn regression equations.

This comparison highlights an important caveat when attempting to use any of these models to estimate pain and suffering. Since regression models are best at predicting values that are close to the average values of the independent variables in the data used to generate the regression coefficients, it is important to try to use cases of comparable severity when generating pain and suffering estimates. Since the medical component of "specials" for a typical hospitalized California flame burn survivor is on the same order of magnitude as the JVR mean, the models reported here should predict typical pain and suffering losses well for hospitalized burn injuries .

Table 15. Summary Statistics: Jury Verdict Research Data and California Hospital Discharge Data on Burn Survivors

	JVR Cases	% of Known	CA Cases	% of Known
Number of Cases				
Jury Award	392	64.7%		
Settlement	209	34.5%		
Both*	5	0.8%		
Demographics				
- Work Status				
Employed	311	67.5%		
Unemployed	81	17.6%		
Student	61	13.2%		
Homemaker/Retired	8	1.7%		
Unknown (% of Total)	145	23.9%		
- Gender				
Male	434	73.9%	310	77.5%
Female	153	26.1%	90	22.5%
Unknown (% of Total)	19	3.1%		
- Age				
Under 18	124	20.8%	83	20.8%
18-64	463	77.5%	277	69.2%
65+	10	1.7%	40	10.0%
Unknown (% of Total)	9	1.5%		
Cause of Burn				
Fire/Flame	303	52.4%	658	36.0%
Electricity	102	17.7%	83	4.5%
Scald	80	13.8%	650	35.6%
Explosion	38	6.6%	116	6.4%
Chemical	29	5.0%	128	7.0%
Contact w/hot surface	26	4.5%	191	10.5%
Other/unknown (% of Total)	28	4.6%	287	13.6%
Highest Degree Burn				
3rd Degree	338	74.5%	141	35.5%
2nd Degree	91	20.0%	216	54.0%
1st Degree	15	3.3%	16	4.0%
No burn	10	2.2%	26	6.5%
Unknown (% of Total)	152	25.1%		
Percent of Body Burned	298	28.8%	250	17.9%

* These cases involved partial settlements by other parties to the suit prior to the jury award. They have been included elsewhere as jury awards.

Table 16. Out-of-Pocket Losses, Jury Awards and Settlements for Burn Survivors

	CASES	MIN	MAX	MEAN	MEDIAN
Medical Charges					
Jury Awards	177	$164	$556,254	$100,308	$54,452
Settlements	85	76	892,618	110,512	43,939
Wage Losses					
Jury Awards	105	$ 40	$2,918,016	$115,271	$24,388
Settlements	34	555	1,727,457	95,275	27,374
Future Losses					
Jury Awards	33	$3,940	$7,787,564	$664,790	$53,155
Settlements	12	5,922	251,079	90,630	75,379
Compensatory Damage Award					
Jury Awards	384	$ 2	$27,800,000	$1,800,000	$822,945
- w/specials	194	2	27,800,000	1,900,000	901,528
- w/o specials	190	1,980	17,500,000	1,770,000	700,860
Settlements	132	1,669	14,800,000	1,700,000	848,288
"Pain and Suffering"*					
Jury Awards	195	0	$19,000,000	$1,540,000	$579,190
Settlements	87	0	$13,900,000	$1,320,000	$491,542

* Pain and suffering is estimated to be the difference between compensatory damage awards and the three loss categories - past medical, past wages, and future losses. Instances where this calculation yields a negative number have been recoded zero.

Table 17. Estimation of Past Wage and Medical Losses

Dependent Variable = Ln (Constant 1992 Dollar Past Losses)

Independent Variables	Mean of Variable	Coefficient	Standard Error
Constant	---	14.18	2.60***
Demographics, etc. EMPLOYED	.618	0.5097	0.249**
AGE	30.5	-0.0017	0.007
SEX	.195	-0.212	0.281
YRDISP	87.4	-0.056	0.0295*
PERCENT	28.6	0.034	0.0056***
THIRD	.635	0.664	0.236***
LIMB	.079	1.336	0.438***
DIGIT	.037	1.894	0.553***
FRACTURE	.012	1.587	0.985*
MINOR	.012	0.615	0.990
EMOTIONAL	.091	1.166	0.363***
ANOXIA	.041	1.069	0.525**
Cause of Injury (default: fire) CHEMICAL	.050	0.189	0.486
EXPLOSION	.071	0.532	0.422
SCALD	.129	-0.592	0.340*
CONTACT	.058	-0.433	0.474
ELECTRICITY	.178	0.326	0.321
Sample Size		241	
Adjusted R-squared		.395	

* = significant at $p < 0.10$ ** = significant at $p < 0.05$

*** = significant at $p < .01$

Table 18. Pain & Suffering for Burns (cases with past losses known only)

Independent Variables	Mean of Variable	Coefficient	Standard Error
Constant	---	7.47	0.88***
Demographics, etc.: EMPLOYED	.636	-0.320	0.258
AGE	31.3	-.00005	0.007
SEX	.170	-0.233	0.288
PROFESSIONAL	.042	0.367	0.524
Injury Severity: Ln (Medical & Wages)	11.057	0.430	0.073***
PERCENT	30.73	0.0199	0.006***
THIRD	.655	0.337	0.234
LIMB	.091	0.315	0.411
DIGIT	.042	0.089	0.576
SCARS	.236	-0.028	0.245
EMOTIONAL	.091	0.500	0.373
AGGRAVATE	.006	-0.542	1.331
SERIOUS	.036	-0.375	0.632
ANOXIA	.048	0.302	0.491
Cause of Injury: CHEMICAL	.042	0.620	0.528
EXPLOSION	.085	-0.414	0.374
SCALD	.115	-0.600	0.345*
CONTACT	.048	-1.199	0.603**
ELECTRICITY	.200	0.156	0.324
Liability Issue: WORKCOMP	.170	0.464	0.565
MALPRACT	.018	0.242	1.049
OCCNEG	.170	0.544	0.548
PREMISES	.200	0.293	0.520
PRODUCTS	.400	0.335	0.527
INVOLVE	.430	-0.254	0.209
BUSINESS	.285	-0.032	0.225
GOVT	.012	-1.045	0.954
Sample Size		165	
Adjusted R-squared		.553	---

* = significant at $p < 0.10$ ** = $p < 0.05$ *** = $p < .01$

Table 19. Pain & Suffering for Burns (estimated from medical losses only)

Independent Variables	Mean of Variable	Coefficient	Standard Error
Constant	---	5.97	1.17***
Demographics: Plaintiff Employed	0.631	0.14	0.33
Age of Plaintiff	31.71	0.0005	0.01
Sex (male=0, female=1)	0.17	-0.22	0.38
White Collar Worker	0.05	-1.77	0.63***
Injury Severity: LN(Medical)	10.75	0.62	0.10***
Percent of Body Burned	30.54	0.02	0.01**
Third Degree Burns	0.68	-0.40	0.32
Amputation of Limb(s)	0.09	1.15	0.51**
Amputation of Finger or Toe	0.05	1.11	0.70
Scars	0.21	0.26	0.33
Emotional Trauma	0.07	1.20	0.56**
Aggravate Existing Condition	0.007	-0.29	1.65
Other Serious Injury	0.03	-0.16	0.89
Anoxia	0.05	0.08	0.66
Cause of Injury: Chemical Burn	0.04	0.78	0.71
- Explosion	0.09	0.09	0.48
- Scald or Steam	0.11	-0.66	0.45
- Contact with Hot Surface	0.05	-3.26	0.73***
- Electricity	0.21	-0.58	0.41
Liability Issue: Worker Injury	0.17	0.20	0.70
- Malpractice	0.01	1.11	1.43
- Occupational Negligence	0.17	0.78	0.67
- Premises Liability	0.19	0.62	0.66
- Products Liability	0.42	0.15	0.63
- Negligence of Plaintiff	0.44	-0.12	0.27
- Business Firm Defendant	0.28	-0.004	0.29
- Government Defendant	0.01	-0.76	1.16
Sample Size		149	
Adjusted R-squared		0.54	1.45

* = significant at $p < 0.10$ ** = $p < 0.05$ *** = $p < .01$

Table 20. Pain & Suffering for Burns (including cases with estimated losses)

Independent Variables	Mean of Variable	Coefficient	Standard Error
Constant	---	6.169	0.510***
Demographics etc: EMPLOYED	.547	0.140	0.171
AGE	31.9	-0.0054	0.005
SEX	.201	-0.089	0.193
PROFESSIONAL	.037	0.615	0.389
Injury Severity: LN(Medical & Wages)	12.12	0.450	0.035***
PERCENT	28.85	0.0206	0.004***
THIRD	.621	0.438	0.160***
LIMB	0.91	0.181	0.293
DIGIT	.037	-0.056	0.415
SCARS	.195	0.114	0.184
EMOTIONAL	.091	0.637	0.246***
AGGRAVATE	.013	-0.629	0.613
SERIOUS	.027	-0.021	0.467
ANOXIA	.030	0.353	0.427
Cause of Injury: (default, fire) CHEMICAL	.047	0.020	0.342
EXPLOSION	.081	0.125	0.262
SCALD	.138	-0.548	0.228**
CONTACT	.047	-0.925	0.380**
ELECTRICITY	.164	0.569	0.243**
Liability Issue: WORKCOMP	.164	0.561	0.320*
MALPRACT	.030	0.772	0.499
OCCNEG	.181	0.644	0.297*
PREMISES	.174	0.486	0.298*
PRODUCTS	.369	0.677	0.281**
INVOLVE	.379	-0.169	0.146
BUSINESS	.228	0.171	0.174
GOVT	.010	0.286	0.700
Sample Size		298	
Adjusted R-squared		.640	

* = significant at p < 0.10 ** = p < 0.05 *** = p < .01

6. LITIGATION COSTS

Litigation costs were estimated using RAND Corporation studies. Kakalik and Pace (1986) find court costs for non-auto tort claims average $954 (inflated to November 1992 dollars using the Consumer Price Index - All Items), and defense attorney fees and expenses average $11,766, or 97.4 percent of average plaintiff fees and expenses. They value time and out-of-pocket expenses (for example, for transportation) at $1,908 per case for plaintiffs and $6,678 for defendants. Defendants also spend an average of $1,272 on claims processing.

The comparison of jury verdicts with burn incidence by cause showed that flame burn victims are 1.45 times more likely to sue than the average burn victim. Hensler et al. (1991) find that only one percent of people who mostly blamed themselves for their injuries hired lawyers, compared to 13 percent of those who mostly blamed someone else. These percentages rise with injury severity. Non-work, non-motor vehicle injuries lead to far fewer claims. At most three percent of seriously injured people in this category seek liability compensation. Often, there is no one to sue. If the at-most three percent claiming rate applied to burn injuries overall, the claiming rate for flame burns would be about four percent (3% * 1.45). For occupational injuries (firefighter injuries in this context), Hensler et al. report a 7-percent claiming rate.

The plaintiffs' costs average 33 percent of the award or settlement (Hensler et al., 1991). At the time of interview, 50 percent of those who claimed with legal representation had obtained payment, 9 percent had not, and 40 percent had cases pending. Ultimately, NPSRI assumes 70 percent will receive some compensation. Wage and housework loss data from Chapter 8, the medical cost data from Chapter 2, and the pain and suffering estimates in Chapter 8 can be combined with the estimates above to compute expected litigation costs. These computations use best estimates of actual jury verdicts rather than of pain and suffering. Actual awards are 4 percent lower than average losses due to contributory negligence. For fatalities, guided by Jury Verdicts Research averages through 1986, NPSRI assumed fatal awards average $1.2 million for civilians and $1.5 million for firefighters.

The equation to compute litigation costs for civilian fire deaths and hospitalized flame burn injuries is: .04 * [954 + 1908 + 6678 + 1272

+ 0.7 * 0.33 * (1.0 + 0.974) * (Medical + EMS + Productivity + Quality of Life)].

For firefighter injury, the same equation applies except that the claiming rate of .04 is replaced by a rate of .07.

7. EMERGENCY TRANSPORT COSTS

NMES data show that the average payments for private ambulance transport are $221 for hospitalized cases and $167 for nonhospitalized cases. By comparison, NMCUES showed averages of $200 and $176 respectively. (All payments were inflated to November 1992 dollars using the Consumer Price Index - All Items). Cost of injury studies (e.g., Rice et al., 1989) typically accept NMES/NMCUES data as average ambulance transport costs.

Charges for helicopter transport average $2,381. Charges for fixed wing aircraft transport average $2,743 for piston planes, $3,662 for turboprops, and $3,108 for turbojets. These figures are from the 1992 Transport Charge Survey (an annual Journal of Air Medical Transport survey). They include base fees, mileage charges, and medical team professional fees if any. Rice et al. (1989) estimate about 3,000 burn cases were transported by air in 1985.

Rice et al. (1989) assume 20 percent of burn survivors treated in the emergency room and released were transported by ambulance. Transport charges per case average $33.

Among hospitalized burn victims, Burn Foundation data suggest probabilities of helicopter transport, ambulance transport, and double transport (for transfers) of 11%, 57%, and 29% respectively. Table 21 breaks these figures down by injury category, arriving at average transport charges of $454/burn center case. Burn plus anoxia cases average twice this amount. Community hospital burn admissions average a $143 transport charge. Overall, transport charges average $268/admission.

To compute community hospital admissions in Table 21, observe that the NHDS estimates 57,000 burn admissions in 1990 and the annual American Burn Association survey estimates 23,000 burn center admissions. Thus, community hospital cases in the Burn Foundation catchment area should equal (57000-23000)/23000 times the burn center cases. Helicopter transports were subtracted from direct admissions. The analysis then assumed the distribution of community hospital cases by nature (i.e., burn only, burn plus anoxia, etc.) would match the distribution of direct burn centers admissions not transported by helicopter.

To compute total transport charges, all transfers were assumed to have an ambulance transport prior to transfer. Other assumptions were that all community hospital transports were by ambulance and that the probabilities of transport equalled the probabilities for Burn Foundation burn center cases not transported by helicopter.

The estimates in Table 21 use the Burn Foundation transport profile. Querying other burn centers at the expert conference or by telephone suggested that nationally helicopter transport to burn centers might occur 15-20 percent of the time rather than 11 percent. Table 22 summarizes their estimated transport rates. Also, NEISS suggests a thermal burn transfer rate of 24.8 percent might be more accurate than a 29 percent rate. The average transport would cost $327 rather than $268 with these percentages. The average Burn Center transport would cost $600. These estimates seem more representative than the estimates from Burn Foundation data alone.

For injury deaths, coroners' costs average $394. This figure was applied to burn deaths. About 40 percent of flame burn deaths occur at the hospital, presumably with transport charges similar to burn center cases. The remaining cases presumably are not transported. Overall, transport and coroner charges per death average $576.

Table 21. Analysis of Emergency Transport, Based on Burn Foundation Data

	Burn Only	Burn + Anoxia	Anoxia Only	Burn DK Anoxia	Total
NUMBER OF CASES BY TRANSPORT					
Ambulance	1606	284	23	105	2018
Helicopter	214	143	2	29	388
Other	1012	69	10	16	1107
Total	2832	496	35	150	3513
PERCENTAGE OF CASES BY TRANSPORT					
Ambulance	56.7%	57.3%	65.7%	70.0%	57.4%
Helicopter	7.6%	28.8%	5.7%	19.3%	11.0%
Other	35.7%	13.9%	28.6%	10.7%	31.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
DETAILS OF ADMISSIONS AND PROBABILITY OF TRANSFER					
BC Direct	806	112	18	44	980
LessCopter	755	86	17	37	895
BC Transfer	1990	382	17	105	2494
AllBurnCntr	2796	494	35	149	3474
CommunHosp	4467	333	128	207	5135
Total	7263	827	163	356	8609
% Transfer	27.4%	46.2%	10.4%	29.5%	29.0%
% Burn Cntr	38.5%	59.7%	21.5%	41.9%	40.4%
TRANSPORT CHARGES PER CASE (in November 1992 dollars)					
Burn Center	$366	$915	$304	$680	$454
CommunHosp	$136	$178	$154	$192	$143
All	$224	$618	$186	$396	$268

DK = Unknown if; Cntr = Center

Source: National Public Services Research Institute, 1993, estimated from Burn Foundation data.

Table 22. Estimates of Percentage Transported by Transport Mode at Selected Burn Centers

Burn Center	Admits*	Helicopter	Ambulance	Other
San Diego	400	10	40	50
Washington	200	20	75	5
Tampa	200	30	60	10
Baltimore	250	20	75	5
St. Paul	200	20	75	5
Syracuse	100	neg.	60	40
Cleveland	350	20	45	35
Tulsa	200	25	60	15
Portland	200	20	50	30
Dallas	400	20	50	30
Seattle	400	20	40	40
Philadelphia	900	11	57	32
COMPOSITE	3800**	20	55	32
		(ROUNDED TO NEAREST 5%)		

* Annual average to nearest 50 admissions, based on data submitted to American Burn Association for the years 1986-1990.

** These 12 generally larger burn centers represent about 15% of the nation's burn centers and admit about 13 to 15% of the nation's burn center patients. These figures were estimates by burn managers. They may be biased to the high side due to the more memorable nature of a helicopter transfer compared to other modes.

Source: The Burn Foundation, 1993.

8. TOTAL COSTS BY INCIDENT SEVERITY

This chapter summarizes the costs of cigarette fire injury by incident severity. For burn injury and anoxia injury, it lists total medical costs including emergency transport, productivity losses, litigation costs, and pain and suffering. Table 23 summarizes the costs per case. It also estimates total costs for all cigarette fire burns without accelerants.

The case counts in this table largely come from NFIRS with unknowns distributed. CPSC removed cigar and pipe fires and arson from the data (about 4 percent of the nonfatal cases and 5 percent of the fatalities). The hospitalized smoking fire incidence estimates were described earlier. Unpublished CPSC data were used in the emergency room estimates. These data show 46 percent of emergency room cases treated for residential flame burn are in incidents attended by the fire department. This percentage was divided into NFIRS counts of cigarette flame burns and anoxias treated in emergency rooms (including admitted cases). It was not applied to non-burn injuries or other levels of treatment. It adds 3,297 to the NFIRS count of cases treated in emergency rooms. One of the case studies describes a serious cigarette fire that was not attended by the fire department.

The percentage transported by category also came from NFIRS data. Emergency room cases in fires not attended by the fire department were considered not transported. All firefighter deaths were assumed to involve transport.

Litigation, Productivity, and Pain and Suffering Computations

Litigation costs were assumed to apply only to hospitalized and fatal cases. Computing litigation costs and possibly pain and suffering requires data on productivity losses -- lost earnings, fringe benefits, and housework. These were computed in stages. First, the NFIRS age and sex profile for cigarette fire victims was inserted in a standard lifetime earnings model (King and Smith, 1988; Rice et al., 1989; Miller et al., 1991; Douglass et al., 1990). Following King and Smith, the computations used a 2.5-percent discount rate and a 1-percent productivity growth rate, toward the high middle of the rates typically used in jury verdicts (U.S. Supreme Court, 1983). (High-end rates yield low-end loss estimates.) This yielded the loss per fatality. The loss was low compared to the average loss for U.S. fatal injuries because the average cigarette fire victim is much older, and therefore earns less, than the average fatal injury victim. An NFIRS

age-sex profile also was used for firefighters. The firefighter lifetime earnings estimate is conservative because it uses an average age-earnings profile. Paid firefighters earn above-average salaries (Bureau of the Census, 1991, Table 678), and volunteers probably earn at least the average, as well as contributing productive volunteer labor to society.

Average earnings losses for nonfatal injury include both a temporary disability component and a permanent disability component. Table 24 shows probabilities of permanent partial and total disability for burns and for all injuries (used here for firefighter injury and for civilian non-burn injury). Partial permanent disability reduces earning power by 17 percent on average (Miller et al., 1991). This percentage is used for nonhospitalized permanently disabling burns and all non-burns. For permanently disabling hospitalized burns, this study assumes a 33-percent average. Multiplying disability probabilities times expected lifetime earnings yields the permanent disability component of lifetime productivity loss.

To compute the short-term component of productivity loss, the average daily value of household production from Miller et al. (1991) and Douglass et al. (1990) and the U.S. average daily per capita income (averaged across 365 days) including supplements (Bush, 1993) were used. For nonhospitalized injuries (burn and total), the days of wage work lost were assumed to equal the NHIS average number of beddays plus 20 percent of the NHIS restricted activity days reported in National Safety Council (1992). For household production, productivity on all bed days and restricted activity days were assumed to be lost. Nonhospitalized burn productivity losses were distributed between emergency room and other medical treatment cases in proportion to the medical payments involved. Anoxia productivity losses were assumed to equal burn productivity losses for nonhospitalized cases and one third of burn losses for hospitalized cases.

Clearly, the short-term productivity losses estimated here are less accurate than the medical losses. For this reason, the pain and suffering regression based on just medical losses seems a better choice than the one that also requires productivity losses. Table 23 largely uses estimates from that regression for burn and anoxia injuries. The other regression would yield much larger estimates for nonhospitalized injury and lower estimates for hospitalized injury. The regression computations use the NFIRS smoking-fire-related mean percentage female and percentage of burns involving anoxia. They use the means for jury verdicts on flame burns only for other variables (with contributory negligence deductions and other causes set to zero). For anoxia only cases, all burn characteristics were set to zero and anoxia was set to one.

The nonhospitalized pain, suffering, and lost quality of life estimates from even the medical cost regression seemed high. For this reason, pain and suffering for non-hospitalized burn or anoxia injury was computed from hospitalized burn injury pain and suffering using the assumption that it varied linearly with medical costs. This assumption reduced the pain and suffering estimates for burn injuries treated in the emergency room by a factor of 5 and for burn injuries treated at the scene or a physician's office by a factor of 10. With this assumption, the average nonhospitalized cigarette burn survivor has combined productivity and pain and suffering losses of $10,142. By comparison, using completely different methods that rely heavily on one physician's estimates of typical impairment following burn injury, Miller et al. (1993) estimate the comparable losses for all nonfatal burn survivors at $7,641.

The $2 million dollar average value for the family's lost quality of life, pain, suffering, and productivity losses per fatality came from prior CPSC regulatory analyses. Subtracting productivity loss yields a value of $1.39 million for lost quality of life. The same $1.39 million loss was assumed to apply for firefighter deaths. These numbers are quite conservative. Department of Transportation (DOT) regulatory analyses use a $2.6 million value. The value comes from a meta-analysis of 47 technically sound studies. Viscusi suggests a higher range of $3-5 million per death averted. The Environmental Protection Agency, with the consent of the U.S. Office of Management and Budget uses values as high as $9 million. The Nuclear Regulatory Commission uses $5 million for radiation burn deaths. Using even DOT's relaively conservative values would raise the estimated annual cigarette fire losses by $700 million.

For all injuries, Table 23 uses the estimates of pain, suffering, and productivity loss from Miller et al. (1993). It then nets out the productivity loss estimates. Miller et al.'s estimates are routinely used in regulatory analysis by the U.S. Department of Transportation. Applying the burn regression equation to compute pain and suffering for all hospitalized injury would yield an estimate of $200,000 instead of the $235,000 shown here.

The litigation costs were computed using the parameters in Chapter 6 and the costs in Table 23. No legal fees were associated with unsuccessful claims taken on a contingent basis. Similar to the CPSC Injury Cost Model, medical insurance administrative costs were computed as 7 percent of medical payments, with a minimum of $15 per claim.

Summary of Costs

Each cigarette fire death cost $2.1 million on average, hospitalized injuries cost $875,000, and other medically treated injuries (including an unknown number of firefighter hospitalizations) cost $15,000. Nonfatal costs were higher for burn victims than for victims of other types of injury. The costs of firefighter injury exceeded the costs of other victim injury because of differences in age profiles.

Injury costs of 1990 cigarette fires without accelerants totalled $3.5 billion (in November 1992 dollars). Pain and suffering and productivity losses dominated this total. They are 98 percent of the losses for fatalities and 92 percent for nonfatal injuries. Medical payments for cigarette fires totalled almost $75 million (Figure 7). Deaths accounted for 69 percent of the cigarette fire injury costs. Hospitalized survivors accounted for 28.5 percent of total costs, and the less seriously injured accounted for 2.5 percent (Figure 8).

Table 23. Costs by Cost Category for Cigarette Fire Burns and Total Costs for 1990 Injuries

	Cases	Medical/EMS	Productivity	Pain & Suffer	Legal/Admin	Total
BURN						
Fatal	894	12,000	610,000	1,450,000	22,000	$2,100,000
Hospitalized	1062	51,000	39,000	785,000	16,000	900,000
ER Only	1236	700	3,000	11,000		14,000
Other Treatment	503	100	400	1,500		2,000
ANOXIA ONLY						
Fatal	230	11,000	610,000	1,450,000	22,000	2,100,000
Hospitalized	116	5,000	12,000	110,000	3,000	130,000
ER Only	1310	700	3,000	10,000		13,000
Other Treatment	274	100	400	1,500		2,000
OTHER CIVILIAN INJURY						
Fatal	29	12,000	610,000	1,450,000	22,000	2,100,000
Hospitalized	107	14,000	29,000	235,000	6,000	280,000
Other Treatment	563	600	1,000	11,000		13,000
FIREFIGHTER INJURY						
Fatal	3	12,000	840,000	1,450,000	30,000	2,350,000
Non-fatal	1349	1,000	3,000	22,000	2,000	27,000
SUM OF COSTS FOR ALL INJURIES COMBINED (K = thousands of November 1992 dollars)						
Fatal	1156	13,000K	705,000K	1,673,000K	27,000K	2,420,000K
Hospitalized	1285	56,000K	46,000K	872,000K	22,000K	1,000,000K
Other Treatment*	5235	4,000K	13,000K	62,000K	2,000K	80,000K
Total	7676	73,000K	764,000K	2,606,000K	51,000K	**3,500,000K**
% of Total		2.1%	21.9%	74.6%	1.4%	100.0%

* Includes hospitalized firefighter injuries. Also includes injuries in incidents not attended by the fire department. **Totals were computed before rounding.**

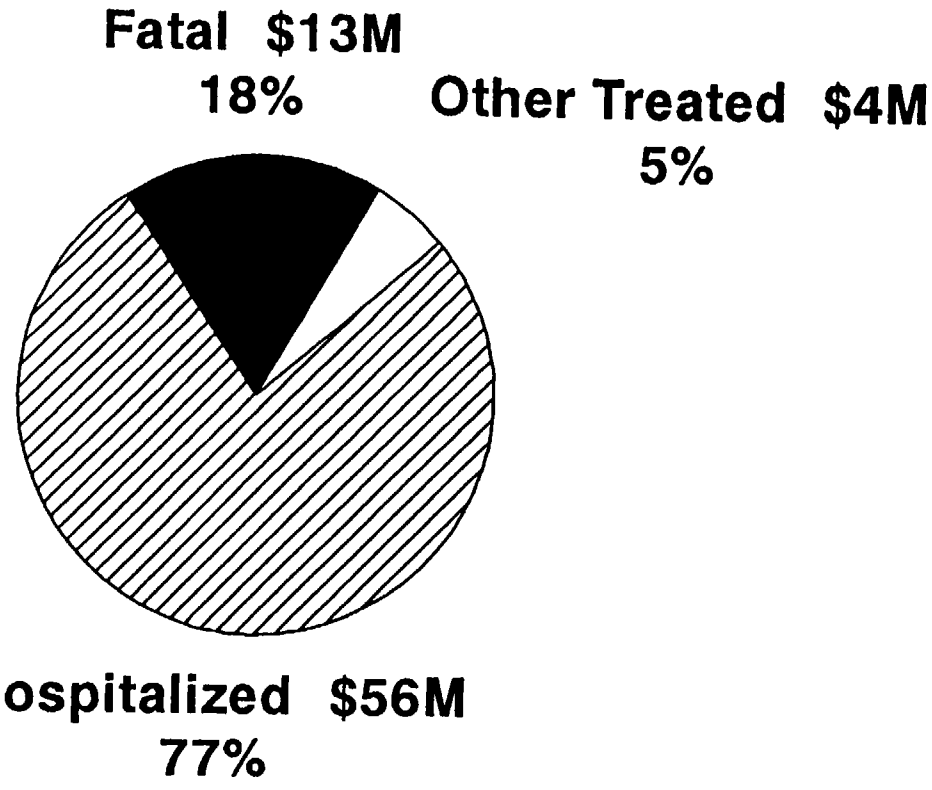
Source: National Public Services Research Institute, 1993.

Table 24. Permanent Disability Probabilities for Burn Injuries and All Injury

	BURN INJURY		ALL INJURY	
	Partial	Total	Partial	Total
Hospitalized	13.9%	1.2%	18.65%	1.3%
Not Hospitalized	1.0%	.14%	0.6%	.03%

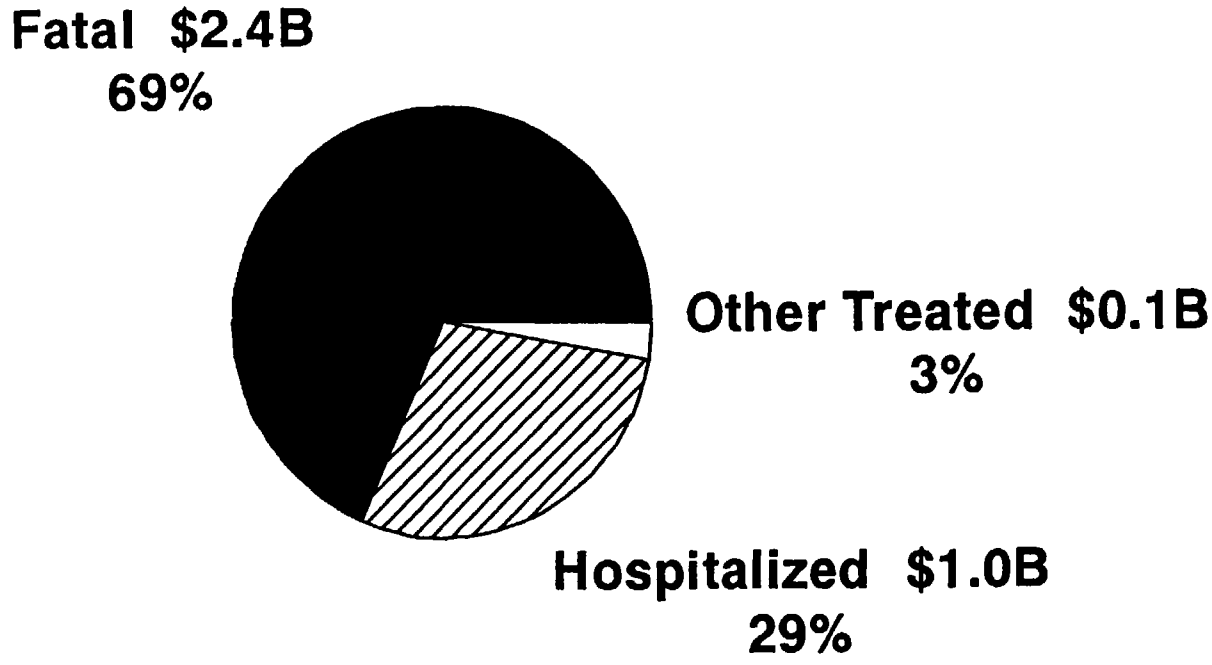
Source: Miller et al., 1993. Computed from DCI and NEISS worker injury data.

Figure 7. Distribution of Cigarette Fire Medical Costs by Injury Severity



Source: National Public Services Research Institute, 1993, in 11/92 $

Figure 8. Distribution of Cigarette Fire Injury Costs by Injury Severity ($3.5 Billion for 1990)



Source: National Public Services Research Institute, 1993, in 11/92 $

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APPENDIX: Number of NHDS Burn Discharges by Year for Primary Diagnosis and All Diagnoses.

YEAR	Primary Diagnosis	95% Confidence Interval	All Listed Diagnoses	Burn Plus Anoxia Cases
1970	90,000	74-106K		
1971	84,000	69-99K		
1972	95,000	79-111K		
1973	92,000	77-107K		
1974	88,000	74-102K		
1975	94,000	77-111K		
1976	92,000	74-110K		
1977	101,000	83-119K		
1978	92,000	76-108K		
1979	89,000	74-104K		
1980	88,000	72-104K		
1981	90,000	75-105K		
1982	80,000	67-93K		
1983	86,000	74-98K		
1984	86,000	76-96K	99,304	3,001
1985	69,000	60-78K	82,563	2,964
1986	68,000	60-76K	81,278	1,288
1987	57,000	50-65K	68,391	1,577
1988	76,000	64-87K	86,247	2,991
1989	60,000	50-69K	67,157	2,358
1990	57,000	48-66K	66,274	1,536
1991	52,000			

Source: National Hospital Discharge Survey data compiled by National Public Services Research Institute and the Burn Foundation, 1993.

APPENDIX: Burn Causation Variables for Length of Stay Regressions

CPSC DEFINITION OF:

- **FLAME** = 1 for injuries caused by fire and flames, in structures or clothing, (cause codes E890-E899, and E923); FLAME = 0 otherwise.

- **ELEC** = 1 for injuries caused by electric current (cause codes E925); ELEC = 0 otherwise.

- **CHEM** = 1 for nonintentional poisoning by liquid substances, gases or vapors, (cause codes E861-E869, E901, and E924.1); CHEM = 0 otherwise.

- **SCALD** = 1 for burning or scalding by hot liquids or vapors, or explosion of a pressure vessel (cause codes E924.0 and E921); SCALD = 0 otherwise.

- **RADIAT** = 1 for exposure to radiation (cause codes E926, E873.3, and E879.2); RADIAT = 0 otherwise.

- **HOT OBJECT/HEAT** = 1 for injuries cause by hot objects, excessive heat (cause codes E873.5, E900, E924.8, and E924.9); HOT OBJECT/ HEAT = 0 otherwise.

Expanded causes include those listed above and add arson, suicide and intentional injury.

- **FLAME** = 1 adds arson, suicide by fire, injury by explosives, (cause codes E968.0, E985, E988.1, and E958.1).

- **ELEC** = 1 adds lightning (cause code E907).

- **CHEM** = 1 adds suicide or assault by poison or caustic substance (cause codes E980, E961, E950, and E952).

- **SCALD** = 1 adds injury by intentional means (cause codes E986.3, E988.2, and E967.0).

Additional causes were used as follows:

- **MV** = 1 for motor vehicle crashes involving a collision in a moving motor vehicle (cause codes E810-E816, and E819); MV = 0 otherwise.

- **OTHMV** = 1 for nontrafffic incidents (cause codes E820-E829, E817, and E818); OTHMV = 0 otherwise.

- **VEHMACH** = 1 for water transport incidents and other vehicle or machine incidents (cause codes, E830-E844.1 and E919); VEHMACH = 0 otherwise.

SUICIDE = 1 for suicide and self-inflicted injury by any means (cause codes E950-E959); SUICIDE = 0 otherwise.

ARSON = 1 for assault by fire (cause code E968.0) ARSON = 0 otherwise.

INTENT = 1 for injury purposely inflicted by others or undetermined (usually intentional) if purposely inflicted (cause codes E960 - E988.2); INTENT = 0 otherwise.

APPENDIX: List of Variables for Pain and Suffering Regressions

Demographics

EMPLOYED	Was plaintiff employed at time of injury? (0=no or don't know; 1=yes)
AGE	Age of plaintiff. Approximations were used if unknown but sufficient information given to approximate.
SEX	Sex of plaintiff (0=male; 1=female)
PROFESSIONAL	White collar/professional (1=office worker, manager or professional; 0=no or unknown)
YRDISP	Year of case disposition.

Injury Severity

PERCENT	Percent of body burned. If not indicated by JVR, but sufficient information was available, estimates were made based on the "diagram of nines" published by the American Burn Association and American College of Surgeons.

NOTE: The following injury severity variables were coded 1 if the JVR write-up mentioned the injury, and 0 if there was no mention. In some cases, these injuries might have occurred, but apparently were not a major claim in the lawsuit.

THIRD	Third Degree Burns.
LIMB	Amputation of limb(s).
DIGIT	Amputation of finger or toe.
SCARS	Permanent scarring mentioned.
EMOTIONAL	Emotional trauma mentioned.
AGGRAVATE	Aggravation of existing condition.
MINOR	Minor (nonburn) injury mentioned, such as contusions, abrasions, lacerations, sprains or strains.
FRACTURE	Fractured bone(s).
SERIOUS	Other series (nonburn) injury mentioned, such as heart attack, serious crushing of limbs, nerve damage or internal injuries.
ANOXIA	Anoxia/smoke inhalation mentioned.

Cause of Burn Injury (all 0-1 dummy variables)

NOTE: The default is burn injury caused by fire.

CHEMICAL	Contact with chemical, hot plastics, molten metals, etc.
EXPLOSION	Explosion such as gas water heater.
SCALD	Injury due to hot water or steam.
CONTACT	Contact with hot surface.
ELECTRIC	Electricity.

Liability Issues (all 0-1 dummy variables)

WORKCOMP	Workplace injury.
MALPRACT	Medical malpractice.
OCCNEG	Occupational negligence such as gas company worker who causes explosion injuring customer.
PREMESIS	Inadequate protection or precautions taken causing owner/manager of premesis to become liable for injury.
PRODUCTS	Defective consumer product.
INVOLVE	Was plaintiff somehow involved in the activity leading up to burn injury, such as active involvement in accident, consumption of alcohol or drugs that might help cause accident, etc.
BUSINESS	Was a business one of the defendants?
GOVT	Was the government one of the defendants?

BURN FOUNDATION CONSORTIUM MEMBERS

RATIOS OF COSTS TO CHARGES
(from Medicare reports)

Fiscal Year	Hospital				
	CCMC	SAMC	LVH	SCHC	Mean
1987	.594	.580	.696	.691	.640
1988	.575	.626	.676	.656	.633
1989	.548	.584	.646	.608	.597
1990	.486	.533	.589	.640	.562
1991	.493	.513	.567	.642	.554
1992	.468	.440	.565	.614	.522

(Composite decrease of 18% in mean (unweighted) RCC from 1987 to 1992)

Appendix B

Experiences of Burn Survivors: Case Studies

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Estimating the Costs to Society of Cigarette Fire Injuries

Submitted to:

Consumer Product Safety Commission
Directorate for Economic Analysis

Contract CPSC-C-93-1118

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July 9, 1993

EXPERIENCES OF BURN SURVIVORS: CASE STUDIES

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OVERVIEW OF CASE STUDIES

This report presents the findings of one task of the study, "Estimating the Costs to Society of Smoking Fire Injuries." This task called for in-depth investigational case studies of burn and anoxia injuries, with emphasis on injuries in cigarette fires. To our knowledge, only one prior case study (Rice, MacKenzie and Associates 1989) probes the long term effects of a burn injury. This report consists of an overview and individual case studies. The overview describes the purpose and methods; provides a summary description of the case study respondents and the interview experiences; and presents a synthesis of common themes and recommendations that emerged from the interviews.

Purpose and Methods

Estimates of the costs of burn injuries using existing data on medical expenditures, hospital discharges, and insurance and legal claims, do not fully describe the impact of these injuries. The purpose of the case studies was to obtain information on the effects of burn injuries on families and society, particularly those impacts which are not readily quantified or captured in standard reporting systems. Particular emphasis was placed on psychosocial costs, long-term impacts of the injury, and impacts on overall quality of life.

The data collection approach was based on the model of in-depth epidemiological investigations (pre-accident; accident; post-accident) utilized by the Consumer Product Safety Commission. Data collection materials included an open-ended discussion guide, a functional capacity questionnaire, and two brief forms to be completed by the respondent (data collection materials are included at the end of this report). Telephone interviews included all items in the discussion guide and the functional capacity questionnaire (one case study involved an in-person interview for the convenience of the respondent, who was still hospitalized). The two brief forms consisted of a checklist titled, "Effect of the Injury on Family and Other Relationships," and "Effects on Overall Quality of Life." These forms were completed during the interview in about half of the cases; in the other cases the respondent mailed the completed forms to the interviewer. The purpose of these forms was to supplement information obtained in interviews where the respondent was reticent in discussing personal feelings, and to provide a standard assessment of quality of life before, six months following, and some time after, the injury. The quality of life "scale" ranged from "terrible" to "terrific." Interviews ranged from 35 minutes to two hours in length.

Difficulty in locating and recruiting respondents for the case studies was a significant problem, which directly affected the methods and extent of this task. Even with the assistance of experienced and committed professionals at burn centers and advocacy groups, the process was lengthy and frustrating. The difficulties included the identification of appropriate candidates from files that, in some cases, were not automated or could not be accessed more than a few years after discharge; the lack of home telephone numbers (some candidates were discharged to shelters); the general mobility of the population; and the unwillingness of some who were contacted to participate in an interview (often because they did not want to think about their injury or recovery). The experience in this study mirrors that reported by other researchers who have used case studies to describe injury impacts (see, for example, Rice, MacKenzie and Associates 1989).

Interview Respondents and Interview Experiences

Interview respondents were referred to us by a national burn survivors' support group and by several burn centers in the eastern and midwestern United States. In recruiting respondents, every effort was made to obtain broad representation by socioeconomic and educational status, sex, race, and length of time since injury. Selection criteria specified cigarette-related fires as the primary emphasis, followed by other flame-related injuries. Despite the difficulty in recruiting respondents, as the table on the following page shows, the completed case studies do offer diversity.

A total of nine interviews were completed. While self-selection bias is unavoidable, the motivations for participation are presumed to be as diverse as the individual situations and personalities represented. Each case study presents a unique experience. Although methods and interviewing techniques were quite uniform, the depth and emphasis of each case study varies because some respondents were more articulate, or more willing to express personal feelings to the interviewer. Three points should be noted in this regard. First, it was apparent that a number of respondents found it difficult to talk about their injuries, even many years after their recovery. Second, denial is an early stage of recovery from psychological trauma. Although a comprehensive psychosocial assessment was not done, it was apparent that some respondents had coped with their tragedies by denying parts of what occurred. Third, several of the respondents have histories of substance abuse, making it difficult in some cases to ascertain whether their disabilities were a result of burn injuries or substance abuse. Since the telephone interview methodology precluded access to medical records, such questions could not be resolved.

SUMMARY OF INTERVIEW RESPONDENTS

Sex	Male	3
	Female	6
Race	White	8
	Black	1
Time Post-Injury	4 months - 27 years	
Cause of Fire	Cigarettes	5
	Arson	1
	Other	1
	Unknown*	2
Quality of Life Now	Better	7
	Worse	1
	N/A**	1

* In both of these cases, cigarettes or matches were considered a possible cause.
** Too soon after the injury to assess.

Each interview was conducted by one of two experienced interviewers who, collectively, have conducted hundreds of interviews with individuals and family members participating in health, social service, educational, and vocational rehabilitation programs. Both interviewers were deeply moved by their discussions with these nine burn survivors. The multiple tragedies experienced by many of these individuals and the long term impacts of their injuries on virtually every aspect of their lives, was striking. Yet, the perseverance of these individuals to get on with, and in most cases, improve their lives, was indeed impressive.

Synthesis: Common Themes and Recommendations

A number of common themes emerge from these case studies. While the small number of cases calls for caution in drawing conclusions, the findings presented broaden our understanding of the circumstances and impacts of burn injuries, particularly those related to smoking fire injuries.

Discussions of the circumstances surrounding injuries revealed that, in most cases, the respondents had experienced other stressful life events close to time of injury. For example, events which preceded or were ongoing at the time of the injury included household moves, separation from

spouse, depression, hospitalization, and unemployment. Other stressful events that occurred subsequent to the injury included death of a spouse, death of a child, divorce, mental health problems requiring clinical intervention, and unemployment of a spouse. While some of these events appeared to be directly related to the fire, others were independent occurrences. The incidence of multiple tragedies and crises in the lives of these injury survivors is consistent with findings of other research. For example, a prospective study of individuals who were seriously injured in motor vehicle crashes found that 29 percent had experienced a death in their extended family in the year preceding the crash (Siegel, Mason-Gonzalez, et al. 1991).

The relationship of these injuries to drug or alcohol use is noteworthy. Three of the five cigarette fires resulted directly from falling asleep or passing out due to the effects of alcohol or tranquilizers while smoking. A fourth fire injury involved a long-time heroin addict.

In terms of treatment received, there was general satisfaction with the medical aspects of care and most respondents had access to a specialized burn treatment center. Respondents were hospitalized from two weeks to nine months, and most had subsequent hospitalizations for reconstructive surgery (23 for one respondent and 30 for another). Intense pain was mentioned repeatedly as a most significant memory of the hospital experience. There was less satisfaction with psychosocial services. Several respondents particularly noted the need for professional counseling to cope with disfigurement.

Health insurance through the burn survivor's employer or their spouse's employer paid for most of the medical costs incurred by four of the nine respondents. One respondent was eligible for care through the Veterans Administration, and one respondent's care was paid for by Workers Compensation (this case was not a cigarette-related fire). Three respondents were either Medicaid recipients or had no means of paying their bills.

In terms of the recovery process, several respondents noted that dealing with feelings of guilt was one of the most difficult aspects of their recovery. Particularly in cigarette fires, respondents felt "it was my fault," or felt that they had done something "stupid." The value of talking with other burn survivors and survivors support groups was noted in several cases. Talking with others who had been through similar experiences was felt to be particularly helpful for working through feelings of guilt and changes in appearance. Six respondents have permanent functional capacity losses as a result of their burn injuries.

The only respondent that reported litigation was not involved in a cigarette fire injury. When asked about litigation, respondents generally replied that there was no one to sue since they were

responsible for the fire. Even when the cause of the fire was unknown, the fear that they may have been responsible kept people from pursuing a case.

Responses concerning quality of life were inspiring, especially considering the substantial adverse affects of the injuries noted above. Six respondents very definitely felt that their lives had improved since their injuries. Some respondents returned to school, which resulted in improved self esteem and career advances. Other positive changes reported were increased family closeness, improved health behaviors and attitudes (such as quitting smoking and exercising more), an increased sensitivity to disabled persons, and a greater appreciation of life.

Conclusions and Recommendations. These case studies provide evidence in support of the belief that the costs of burn injuries are underestimated. Not only are there costs which are not readily quantified, there are also quantifiable costs which may not be routinely captured in conventional reporting systems. One case study describes serious burn injuries sustained in a cigarette fire where the fire department was never notified because the fire was extinguished by a family member. Another case study reports on reconstructive surgery scheduled more than 25 years after the burn injury.

The case studies also suggest some recommendations to be considered, in the areas of prevention and treatment. Although the statement "don't smoke in bed" is familiar, it seems that there is a need for more explicit education and warnings specifically related to the effects of drugs (drowsiness, loss of consciousness, slowed reflexes) and the dangers of smoking while "under the influence." In one case study, the individual fell asleep while taking prescription tranquilizers. Physicians prescribing such medications should inquire about their patients' smoking behaviors and alert their patients to exercise caution while smoking. The case studies also suggest that much more attention be given to the psychosocial aspects of recovery, both through formal services and support groups. Respondents did indicate that there were times in the recovery process that they were not receptive to such services, but then later felt that they could have benefitted from counseling. Therefore, it is important that these services be offered at several points during treatment, both for inpatients and outpatients.

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INDIVIDUAL CASE STUDIES

In the individual case studies that follow, names have been changed and identifying information has been eliminated to protect the anonymity of respondents.

Mr. Anders (10 years post-injury)

Overview

Mr. Anders is a 49 year-old white male who was injured in 1983. In fact, he remembers the exact date of his injury and indicates that, for six or seven years following the injury, he recognized the "anniversary" date. Injured in a residential fire, Mr. Anders had second and third degree burns over 31 percent of his body.

He has been married for 23 years, and has two daughters, ages 21 and 16. His current job, which he has held for over 6 years, is as an operations/financial manager for a company in the Midwest. He has a doctorate in biochemistry, which he had completed prior to his injury. Since then, he has completed advanced degrees in business administration and management. In addition to his regular job, he teaches at a university.

Injury and Circumstances Surrounding the Injury

At the time of his injury, Mr. Anders was living alone in an apartment. He had moved three months previously to start a new job, and his family was to join him later. He was burned in a fire in his apartment at about 1:00 in the morning. The cause of the fire was not definitely determined, but it appeared to have started in the kitchen trash can. Mr. Anders believes the fire was probably started by a cigarette that was not completely extinguished when he emptied an ash tray into the trash before going to bed that night. He believes the neighbors upstairs must have seen smoke and called the fire department. The fire department got him out of the building, and no one else was injured in the fire. All of the burns were to his upper body, from the rib cage up.

Treatment and Services Received

Mr. Anders was in the hospital for six weeks. He then recovered at home and went to the burn clinic for weekly outpatient visits. He also had physical therapy three times per week. The

purpose of the clinic visits was to check on the healing of his wounds and schedule surgeries. He experienced severe pain throughout this period. Strong pain medication, such as morphine and codeine, was provided only in the early stages following his injury. Subsequently, the only pain medication available to him was aspirin, which was not very effective in relieving the pain. Mr. Anders had 10-12 surgeries; his last procedure was in February 1984, almost a full year after the injury. Skin grafts were taken from his legs for his back. In the early stages he wore pressure garments, did stretching exercises, and had surgery to release contractures.

The hospital had a process for care planning, where all of the clinical staff and the patient worked as a team. Mr. Anders thinks this worked well, but, in looking back, feels the hospital could have done more to involve the support group of burn survivors in this process. He feels pain management at the hospital was inadequate, but understands that attitudes toward pain control have changed considerably since his injury.

The hospital also had psychological and social services available, as well as a support group of burn survivors. A psychiatrist did drop by briefly while Mr. Anders was in the hospital, but Mr. Anders didn't want to admit that he needed "that kind of" help at that time. The social service department was very helpful in working out things related to his employer, insurance, and similar matters, but Mr. Anders feels that because the staff have not experienced burn injuries, they can't relate to some of the psychological issues faced, the way the support group can. He feels that the hospital is very supportive of the burn survivors group. For example, they provide controlled access to patients on the burn unit and training through their volunteer department. There is a good relationship between the burn unit nursing staff and support group visitors.

Recovery and Adjustment Process

Mr. Anders indicates he experienced pain, lack of sleep, and strong feelings of guilt for about a year. During the early stages there was a lot of denial of the injury, followed by feeling sorry for himself. At these stages, Mr. Anders feels that visitors from the support group can't be very helpful. Mr. Anders indicated that he experienced mood swings and real ups and downs in feelings of self esteem, even on a daily basis, in the early stages of his recovery. He also experienced short-term memory loss for about the first year after his injury. He was very afraid that he had sustained permanent brain damage, and he feels that it would have been helpful to hear from others that such short-term memory loss is not unusual, and is temporary. He dealt with this fear by reading books with suggestions for memory techniques, and this helped him to

get through this period. In looking back, he thinks the memory loss may have been part of the depression he experienced for the first year post-injury.

Since he had no long term disability coverage, having just started a new job, Mr. Anders' employer allowed him to return to work early and work one or two hours a day in order to continue his benefits. His wife immediately moved in order to care for him, while their children stayed with grandparents for a month before joining them. It was the summer of 1984 before Mr. Anders could resume regular physical activity.

He was very dependent after his injury, and this was difficult to handle. For example, he couldn't brush his teeth because he couldn't bend his arms. (Mr. Anders also noted that it is hard to remember this stage now.) His wife had do some wound debridement, which was very hard for her. It "killed him" because he felt he had ruined everything--she was angry and she was right to feel angry. Psychologically, one of the hardest parts of the recovery process was dealing with the guilt he felt about what he had put his family through. In his support work now with other burn survivors, he tries to help people get past the feeling of having "done something stupid."

He found the burn survivors support group to be the most help in his psychological recovery. The founder of the local group came to talk to him while he was still in the hospital; he had experienced a tragic burn six months before. The support group visits burn unit patients and also has monthly meetings. Mr. Anders went to support group meetings sporadically for a couple of years, but then began to feel that going to the monthly meetings was "wallowing in it," so he stopped going. He got to the point where he realized he was going to live and it was time to set new goals for himself (this was late August 1984). At this point, he started to redesign his career and rebuild his life. The injury changed his life because he couldn't go back to the work he was doing--he was a laboratory biochemist and couldn't continue this work with open wounds. He became more involved in financial management and computer applications, and returned to graduate school.

Mr. Anders' arms and legs are scarred. He has some facial scarring, but very little, even though some grafting was done under his eyes. Because he has very little facial scarring, the issue of disfigurement doesn't come up much in his daily life. If children stare at him in the gym, he tells them it's OK to ask questions about what happened to him. But, the first two years after the injury were very bad--he had a "big red spot" on his forehead, wore pressure garments, and had limited movement--this experience has given him an idea of how to handle disfigurement in others. He feels he learned a valuable lesson because now he knows how others feel who are