with very high T waves, and slow QRS complexes with a rapid resolution of 30-60 minutes.

PROFESSOR R. F. MAHLER (9): Was there any family history of any endocrine disturbance—thyroid, adrenal, or parietal cell antibodies?

PROFESSOR HOFFENBERG: No, there was no family history but we have not conducted a family screen.

DR. WILLIAMS: When I was thinking of hyperkalaemic periodic paralysis I saw as many of the family as I could find. None had any evidence of recurrent muscular weakness.

PROFESSOR HOFFENBERG: I would like to thank Dr. Ledingham and all the participants.

This conference was recorded and edited by Dr. W. F. Whimster.

APPOINTMENTS OF SPEAKERS

- (1) Professor R. Hoffenberg, M.D., F.R.C.P., Professor of Medicine, University of Birmingham
- (2) Dr. J. G. G. Ledingham, D.M., F.R.C.P., May Reader in Medicine, University of Oxford.

- (3) Dr. M. Waite, M.D., M.R.C.P., Lecturer in Medicine, University of Birmingham.
- (4) Dr. M. F. Green, M.B., M.R.C.P., Consultant Physician, Royal Free Hospital, London.
- (5) Professor D. B. Brewer, M.D., F.C.Path., Professor of Morbid Anatomy, University of Birmingham.
- (6) Dr. M. Nellen, M.D., F.R.C.P., Lecturer in Cardiology, Royal Postgraduate Medical School, London W12 0HS.
- (7) Dr. E. R. Williams, M.D., M.R.C.P., Consultant Physician, Walsgrave Hospital, Coventry.
- (8) Dr. W. A. Oliver, M.D., F.R.C.P., Physician and Cardiologist, United Norwich Hospitals.
- (9) Professor R. F. Mahler, F.R.C.P., F.R.C.P.Ed., Professor of Medicine, Welsh National School of Medicine.

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Occasional Survey

Non-fatal Injuries Sustained by Back Seat Passengers

M. S. CHRISTIAN

British Medical Journal, 1975, 1, 320-322

Summary

Of 2 275 cases of non-fatal injuries sustained by all categories of road users 185 were inflicted on back seat passengers. Twenty-six such passengers sustained severe and 66 moderately severe injuries. Only two patients (aged 18 months and 3 years) wore any form of restraint. Back seat passengers may be injured by impact with the rear of the front seat or other objects in the rear compartment; by objects in the front compartment; or by being thrown out of the car completely. An adequate restraint system, such as the lap-and-diagonal type of seat belt, would reduce the incidence and severity of injuries.

Introduction

In recent years the advantage to front seat passengers and drivers of wearing seat belts at all times has been well publicized.¹⁻³ Appeals have tried to stimulate voluntary response by the public and have drawn attention to the marked reduction in severe facial, head, and chest injuries sustained, in particular,

by drivers and front seat passengers. In several states in Australia wearing seat belts has been compulsory for almost three years, and the dramatic drop in the incidence of severe facial and head injuries has been a gratifying result of compulsion. Regrettably, in the United Kingdom seat belt wearing is still optional for the driver and front seat passenger, but hopefully the wearing of seat belts will soon be made compulsory.

Little if any publicity has been directed towards the risks to which back seat passengers are subjected.⁴ Some Scandinavian countries install safety belts in the rear seats of their vehicles routinely, and the study reported here of the injuries sustained by back seat passengers indicates that this measure is not without some justification.

Methods

Detailed questionnaires were sent to all patients who had had non-fatal injuries as a result of a road traffic accident and who had been brought to one major accident centre during 1970-3. About 30% answered the questionnaires completely. The questionnaire was divided into several sections, the first and second relating to personal details of the accident victims, such as age and sex, and a statement as to the nature of the accident. The second section specifically sought information about the class of road user and what forms of restraint, if any, were available and in use at the relevant time. A further section dealt with specific injuries sustained and the effects of these injuries in interrupting the normal pattern of life—for example, by causing time off work or school.

Where the replies were vague or inconclusive reference to the patient's records was made and followed up, if necessary, by an interview with the patient.

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Results

Of the 185 injured back seat passengers about whom we had information 26 (14.1%) sustained serious injuries—that is, life-threatening injuries requiring urgent admission to hospital and treatment and prolonged periods off work or school. Moderately severe injuries were sustained by 66 (35.7%) patients, these being injuries often involving one or more fractures and, in particular, severe facial lacerations and scarring where the period of recovery and return to normal employment or school was less than two months. The remaining 93 (50.3%) sustained minor injuries which were serious enough to warrant immediate attention at hospital and sometimes short periods of admission and observation but where time off work or school was less than two weeks.

Of the 185 back seat passengers injured 51 were aged 15 or under, and of these seven sustained severe injuries, 12 moderate injuries, and 32 minor injuries. Of the 134 passengers aged over 15, 19 sustained severe injuries, 54 moderate injuries, and 61 minor injuries.

Both in adults and in children the head, neck, and face are by far the most vulnerable to injury. No fewer than 36 (19.5%) of the patients with injuries had sustained fractures of one or more bones (table I).

TABLE I—Anatomical Distribution of Injuries among Adults and Children who were Back Seat Passengers. Results are Numbers of Injuries

	Head and Neck	Face	Upper Limbs	Chest and Dorsal Spine	Abdomen, Pelvis and Lumbosacral Spine	Lower Limbs
Children	27	17	6	2	1	6
Adults	65	43	31	19	9	41

MECHANISM OF INJURY

A consideration of the types of injury in relation to the site of impact^a of the vehicle (table II) suggested three main patterns of unrestrained back seat passenger behaviour at the moment of impact.

TABLE II—Severity of Injury related to Type of Accident. Results are Numbers of Passengers Injured

	Frontal Impact	Rear Impact	Side Impact	Single-Vehicle Accident
Severe	13	2	4	1
Moderate	22	9	17	16
Minor	33	23	8	29

Firstly, the victim will be thrown forward at the speed of the car before the moment of impact and his head, face, and possibly chest will hit the rear of the front seat or headrest, if present, or indeed in many cases the back of the occupants in the front of the car. In addition the lower limbs and abdomen may be injured by hard unyielding objects in the rear compartment of the car including the back of the front seats. In this series many upper limb injuries were sustained when the passenger, at the moment of impact, tried to save himself from being thrown forward.

Secondly, the back seat passenger is not only thrown forward but continues to be thrown forward and finishes up in the front compartment of the car, sustaining injuries from hard and immovable objects in the front compartment. This was a particular feature of cases where head-on collisions had occurred at relatively high speeds.

Thirdly, the unrestrained passenger may be thrown completely out of the vehicle, most often from a car which overturns.

This feature was noted in no fewer than 10 patients, all of whom sustained moderately severe injuries, some of which were derived secondarily from impact with the road or bushes on to which they were thrown. This sequence of events occurred most frequently in the single-vehicle accident.

The speed of the vehicle at the moment of impact is shown in table III. No less than 37 (20%) of the back seat passengers sustaining injuries were in vehicles that were stationary at the time of impact.

TABLE III—Number of Passengers Injured according to Speed of Vehicle at Impact

Impact speed in mph (kph)	0	10 (16.1)	20 (32.2)	30 (48.3)	40 (64.4)	50 (80.5)	60 (96.6)	70 (112.7)	>70 (>112.7)
Injured	37	2	18	55	37	18	9	5	4

INJURIES TO VISCERA

Severe visceral injuries occurred in less than 5% of the total back seat passengers, but when they did occur they tended to be severe. Four illustrative cases are given to show the severity and wide distribution of such injuries.

Case 1.—A 19-year-old man was a back seat passenger in a car which was involved in a head-on collision with another car, travelling at about 97 k.p.h. (60 m.p.h.). The patient was trapped in the rear compartment. He sustained fractures of both femora, a fractured pelvis, and a ruptured bladder. The patient was off work for four and a half months and was still attending for out-patient treatment at the time of writing.

Case 2.—A 21-year-old man was a back seat passenger in a car driven at high speed which collided with a bus. The injuries he sustained included severe lacerations of face, bruising of nose, and impaction of glass fragments within the orbit.

Case 3.—A 14-year-old boy was a passenger in the back seat of a car involved in a head-on collision. Apparently he hit his chest on the back of the front seat and sustained a tear of the intraventricular septum. This necessitated cardiac surgery for repair of the tear and resulted in three years' loss of schooling.

Case 4.—A 20-year-old woman was a rear seat passenger in a car travelling at 32-48 k.p.h. (20-30 m.p.h.) which collided head-on with another vehicle. The injuries sustained included broken teeth and radius, fracture of the pelvis, a dislocated hip, and a fractured ankle. The patient at the time of the accident was 10 weeks' pregnant, and vaginal bleeding and threatened abortion occurred a few days after her admission for treatment of the other injuries. Pregnancy, however, progressed and she eventually delivered a live child two months prematurely.

USE OF RESTRAINT SYSTEMS

In this series no adult who sustained injuries as a back seat passenger was wearing any form of restraint. Three of the children involved were, however, restrained in different fashions:

Case 5.—A 1½-year-old boy was in a child's seat on the back of the car. The car was involved in a head-on collision and the child was thrown from the seat into the front of the car, hitting its head on impact and severely lacerating his scalp and fracturing his skull.

Case 6.—A 3½-year-old boy was in a car safety seat, which was anchored to the car body through the back shelf. This car was involved in a multiple pile-up on a motorway. The car was badly damaged and in fact was unreparable. The patient, however, received one small bruise on his forehead.

Case 7.—An 8-week-old boy was in a carrycot on the floor of the rear compartment of a car which was involved in a head-on collision. The baby was apparently thrown up and banged his head on the ashtray in the rear of the car. He sustained severe bruising of the scalp and was admitted to hospital for 48 hours' observation.

Conclusion

In 1971 344 700 people sustained non-fatal injuries in road traffic accidents, and of these probably 8% (27 576) were back seat passengers. This figure is unlikely to be less in the subsequent years. Of these 27 576 passengers no fewer than half will have received moderate or severe injuries.

Most authorities now accept that there is a dramatic reduction in the severity of injuries, in particular to head, face, and chest sustained by front seat passengers and drivers who are adequately restrained by seat belts. Adequate seat belts worn by rear seat passengers will achieve an equally dramatic reduction in injuries sustained by these passengers. Hence, future legislation to make the wearing of seat belts compulsory should apply to occupants of both rear and front compartments of vehicles.

I am indebted to the Royal Society for the Prevention of Accidents for a grant which made possible part of this investigation and I should also like to thank Professor G. P. Arden, Mr. R. Maudsley, and Mr. M. Swan of the orthopaedic department, Wexham Park Hospital, Slough, for their encouragement and co-operation in carrying out this survey.

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Contemporary Themes

Confidential Inquiries into Maternal Deaths

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British Medical Journal, 1975, 1, 322-323

Prime Object

The appalling maternal death rate during the first quarter of this century has been dramatically reduced firstly by antibiotics to control sepsis and secondly by blood transfusion in cases of haemorrhage. Fortunately the rate has continued to fall because of improvements in our maternity services, but every maternal death is a tragic event, and every endeavour must still be made in each case to try to prevent similar circumstances which might lead to another death.

This is the prime object of the confidential inquiries, concerning which the Department of Health has published triennial reports since 1952.¹ We must continue to examine and criticize our practice of obstetrics in order to improve still further the safety of childbearing.

The area medical officer (before April 1974 the medical officer of health) usually initiates the inquiry by sending an inquiry form to the consultant or other doctor responsible for the patient's care. These doctors are encouraged to obtain and supply as much clinical information as possible together with a report on the post-mortem examination if obtainable, including any histological evidence.

The completed form is then sent to a regional assessor, a senior consultant obstetrician appointed by the Chief Medical Officer of the Department of Health and Social Security. He may take the case further by his inquiries and then add his summing up and an opinion on any avoidable factors which he thinks were present. Since January 1973 deaths associated with anaesthetic procedures have also been assessed by a senior consultant anaesthetist in each region.

The forms are then sent to the Department of Health and Social Security (D.H.S.S.) and thereafter are seen only by the

Department's consultant advisers in obstetrics and anaesthesia and a departmental medical officer, who together are responsible for correlating the information, classifying the cause of death, keeping a consistent standard of assessing avoidability, and finally writing the triennial report. Valuable assistance is obtained from the Office of Population Censuses and Surveys, and several meetings are held with the regional assessors before the report reaches its final form. Strict confidentiality is maintained at every stage.

Over 90% Covered

All deaths due to or associated with pregnancy mentioned in death certificates are reported to the D.H.S.S., and the regional assessors are periodically informed of these reported maternal deaths so that an inquiry, if not already in progress, can be initiated. Furthermore, the Chief Medical Officer of the D.H.S.S. also receives confidential information about maternal deaths from coroners even if the fact of pregnancy has not been mentioned on the death certificate. These deaths are included in the inquiry if sufficient information is available. Coverage by the inquiry has now been increased to over 90% of all known maternal deaths.

A maternal death is included in the inquiry if it occurred during pregnancy, labour, or within one year of abortion or delivery. The number of deaths occurring more than 42 days after abortion or delivery is mentioned under each cause of death to allow comparison with other countries which follow the recommendation of the International Federation of Gynaecologists and Obstetricians, which excludes maternal deaths occurring later than 42 days.

The causes of death are classified according to the International Code of Diseases (8th revision). Many deaths have more than one cause, but each death is coded to one and only one main cause, which is not necessarily the cause shown on the death certificate. When there is more than one cause a death will be discussed in more than one chapter. For example, if a woman dies from pulmonary embolism following caesarean section for placenta praevia the death will be discussed in the chapters on

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