tent with the finding of Naeye et al. who noted that infants with *histologic* evidence of infection were, on the average, older than those without.[7] However, it should be pointed out that Valdes-Dapena, also using histologic changes as evidence of infection, failed to find a significant difference in the age of death between the two groups of infants (personal communication). The reason is unclear for the discrepancy between these two latter studies. Nonetheless, the data obtained in this study, employing historical evidence of a nasopharyngitis, are compatible with the expectation derived from the sleep apnea hypothesis.

The data also demonstrate that, within the first eight weeks of life, a relatively small percentage of SIDS cases occur in association with a nasopharyngitis. This would occur if a nasopharyngitis, in this age period, were less effective in triggering the SIDS event. However, the data obtained by Dingle et al.[8] suggest another possibility. These authors observed a low rate of minor respiratory tract infections in the initial weeks of life. Thus, the relatively small number of nasopharyngitis-associated SIDS cases could reflect a decreased exposure and/or decreased susceptibility to a nasopharyngitis.

It is fully recognized that this study suffers from the many deficiencies applicable to retrospective studies employing data obtained under far from optimum conditions. Nevertheless, it is difficult to identify any factors that would have introduced a consistent bias producing the results obtained.

SUMMARY

Infants who died of SIDS in Onondaga County (New York) were classified into a Nasopharyngitis Group (N = 59) or a No Nasopharyngitis Group (N = 57) on the basis of symptoms, within one week prior to death, referable to the upper respiratory tract. Examination of the postnatal age of death revealed that infants in the Nasopharyngitis Group tended to be older than those in the No Nasopharyngitis Group. These results are consistent with a prediction derived from the hypothesis that prolonged sleep apnea is part of a pathophysiologic process resulting in SIDS.

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Supported in part by grant 1-R01-HD07460 from the National Institute of Child Health and Human Development.

REFERENCES

1. Valdes-Dapena MA: Sudden and unexpected death in infancy: A review of the world literature: 1954-1966. *Pediatrics* 39:123, 1967.
2. Beckwith JB: The sudden infant death syndrome. Curr Probl Pediatr 3:1, 1973.
3. Ray CG, Beckwith JB, Hebestreit NM, Bergman AB: Studies of the sudden infant death syndrome in King County, Washington: I. The role of viruses. JAMA 211:619, 1972.
4. Urquhart GED, Grist NR: Virological studies of sudden, unexplained deaths in Glasgow: 1967-70. J Clin Pathol 25:443, 1972.
5. Steinschneider A: Nasopharyngitis and prolonged sleep apnea. *Pediatrics* 56:967, 1975.
6. Siegel S: Nonparametric Statistics for the Behavioral Sciences. New York, McGraw-Hill Book Co Inc, 1956.
7. Naeye RL, Fisher R, Ryser M, Whalen P: Carotid body in the sudden infant death syndrome. Science 191:567, 1976.
8. Dingle JH, Badger GF, Jordan WS Jr: Illness in the Home: A Study of 25,000 Illnesses in a Group of Cleveland Families. Cleveland, The Press of Western Reserve University, 1964.

ACKNOWLEDGMENT

I am extremely grateful to Paul Sheehe, Ph.D., Department of Preventive Medicine, and Leonard B. Weiner, M.D., Department of Pediatrics, State University of New York, Syracuse, for their critical comments during the preparation of the manuscript and to Martin Hillfinger, M.D., Medical Examiner of Onondaga County, for his continued cooperation.

Injuries Resulting When Small Children Fall Out of Bed

Children frequently fall out of bed but seldom incur serious injury. When such a fall raises parental concern, the pediatrician is consulted; even in this group, the child is rarely found to have a severe injury. There is a clinical impression that skull radiographs, when taken in these situations, are of extremely low yield and are not necessary as a routine.

Occasionally a child who is reported to have fallen out of bed presents with a skull fracture, cerebral edema, retinal hemorrhage, subdural hematoma, and/or epidural hemorrhage. These severe injuries are discrepant with the history; it is often this discrepancy that indicates child abuse. There are, however, few objective data on the incidence of skull fractures, head trauma, or

other injuries in infants who fell out of bed and in whom there is no suspicion of child abuse.

This study of 246 children under 5 years of age who fell out of bed provides documentation of the degree and severity of cerebral injuries.

PURPOSE AND METHOD

The purpose of this study was to determine the nature, seriousness, and likelihood of injuries resulting when children aged 5 and under fall from the height of a bed or sofa, a height less than 90 cm (36 in). Two approaches were used to gather appropriate data:

1. Parents coming into the offices of private pediatricians were asked to complete a one-page questionnaire regarding incidents of "falling out of bed."

2. All incident reports over a six-year period from a large children's hospital were reviewed. Only those incidents resulting from a fall from a crib, bed, or examination table were included in the study.

Eight private pediatricians cooperated in the study. Parents who came to the office were asked to record, from their memory, incidents of falls from a bed or sofa and to indicate what injuries resulted. When a potentially serious injury was reported by the parents, the pediatrician's records and staff were consulted to determine the extent of the injury. Clearly, parents would have a better recollection of falls resulting in an injury than those in which nothing happened. This no doubt skewed the results toward the more serious end of the continuum. On the other hand, the completion of the questionnaire was voluntary, which may have skewed the results in the opposite direction.

The hospital incidents review did not have this built-in bias. Permission was granted by the hospital administration to review *all* incidents between 1969 and 1975. Only those incidents involving children aged 5 or under who fell from beds, cribs, or examination tables were included. These charts were reviewed. If x-ray films were taken, they were reviewed as well. Only the section of the chart that related specifically to the fall and its follow-up was examined. The assumption was made that the hospital falls would provide a more accurate record of the type of injury, as they were more easily documented in the chart and/or in the required incident report. In addition, a fall from a hospital crib or examining table is generally from a height of approximately 90 cm (somewhat higher than a sofa or a bed in the home). The hospital fall was almost always a fall to a noncarpeted floor.

RESULTS

Questionnaire Survey

Parents reported on 161 children, age 5 years or less, falling out of bed or off a sofa on one or more occasions. The parents stated that 176 of the incidents (80%) resulted in no observable injuries. Of these falls, 169 were from beds or sofas 90 cm or less in height, five were from a height of approximately 120 cm (48 in), and two from approximately 150 cm (60 in).

There were 37 injuries (17%) reported of a nonserious nature, i.e., bumps, lumps, bruises, scratches, and the like. Six additional injuries (3%) were more severe: there were three fractured clavicles (one child fractured a clavicle in two separate incidents), two fractures of the skull, and one fractured humerus. All six injuries were from falls of 90 cm or less. While they were more significant than the other 37 injuries, none of the five children with fractures had any serious sequelae; the two with the skull fractures had no evidence of serious head injury according to their physician's report and the reports of the x-ray films. The two skull fractures and the humeral fracture were in children aged 6 months or less. The three fractured clavicles occurred in children older than 6 months and less than 5 years of age.

None of the 161 children suffered any serious, life-threatening injuries from their falls.

Hospital Incidents Report

Results from the review of the incidents revealed 85 reports of children, aged 5 years or less, who fell to the floor from heights of approximately 90 cm. An additional 88 incidents of falls from laps, chairs, toys, or walking were not included in this assessment.

The 85 incidents resulted in the following injuries (in some incidents there was more than one finding): in 57 incidents there was no apparent injury; in 17, children had small cuts, scratches, and/or bloody noses; in 20, children had a bump and/or bruise; in 1, a child had a fracture of the skull with no serious or apparent sequelae. This child fell off an emergency room cart. There were no signs of soft tissue injuries over the site of the fracture.

Of the 85 incidents, all but four hospital charts were found and reviewed. Of the four that could not be located, the incident reports indicated the following: two children with bumps on the forehead, one with a bruise on the back, and one without injury.

There were 40 x-ray films taken following these

85 incidents. Thirty-seven were found and reviewed. This review did not identify any fractures other than the one noted above.

DISCUSSION

In most cases, when a child falls out of bed or from a sofa, a trivial injury occurs. This study documents the absence of significant cerebral injury. At a cost of $33 per examination, the cost of 246 skull radiographs would be $8,018 with a yield of three in 246, or 1.2%. Even in those cases where a fracture occurred, treatment was not necessary. It is to be noted that in the fractures seen, *none* were bilateral and *none* were diastatic. None were greater than 1 mm in width. Bilaterality, diastasis, or signs of increased intracranial pressure were not found in these 85 children who fell "out of bed." In this study, the relationship between the three skull fractures and the fall cannot be stated for certain. In the fracture that was found in the hospital incident, there was no soft tissue swelling to indicate a recent injury to the head.

The necessity for obtaining skull radiographs in every case of trauma to the head has been scrutinized with the conclusion that the physician's clinical evaluation of signs and symptoms is the most important factor in the determination of a skull fracture or other cerebral injury.[1,2] "Twenty per cent of skull radiographs are performed for trivial injury and 34% for medical legal reasons."[1] By adhering to more stringent criteria for ordering skull radiographs, Children's Hospital of Michigan has decreased these examinations by 16%.[3]

In the Hardwood-Nash study when significant cerebral injuries such as epidural hematoma and subdural hematoma did occur, at least 50% of the children had no skull fractures.[2] The results of physical examination provide the most important indication for continuing the workup (skull radiographs, computerized axial tomography, arteriography, etc.). The physician should be extremely suspicious of child abuse if he/she examines a child with serious head injury, with or without skull fracture, when the cause of the injury is reported to be a fall from a bed, sofa, or crib.

CONCLUSIONS

The review of results of 246 children, aged 5 years or less, falling out of bed (219 at home and 95 in the hospital) revealed no occurrence of serious injury. Three children had identifiable skull fracture on x-ray films; none had resultant CNS damage from reports of the physician's records. Emphasis should be given to the fact that the follow-up of the incidents in the hospital was generally 24 hours, whereas in the home it was, of course, considerably longer. From this study we must conclude that severe head injury and CNS damage or injury of any type are extremely rare when children, aged 5 years or less, fall out of bed.

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REFERENCES

1. Bell RE, Loop JW: The utility and futility of radiographic skull examination for trauma. N Engl J Med 284:236, 1971.
2. Hardwood-Nash DC, Hendrick EB, Hudson AR: The significance of skull fractures in children. Radiology 101:151, 1971.
3. Ad Hoc Committee Report Children's Hospital of Michigan Concerning Radiographic Examination of Skull for Trauma, December 1975.

ACKNOWLEDGMENT

We wish to thank Mary Abramson, R.N., for her assistance with the chart reviews.

Unsuspected Hyperosmolality of Oral Solutions Contributing to Necrotizing Enterocolitis in Very-Low-Birth-Weight Infants

In recent years necrotizing enterocolitis (NEC) has become a major problem in neonatal intensive care units. Recent incidences as high as 8% in all infants with a birth weight less than 2.5 kg and 14% in those with a birth weight less than 1.5 kg have been reported from one center.[1] Despite intensive searches for possible causative factors, no definite entity has been identified, but asphyxia,[2] circulatory changes associated with exchange transfusion,[3] umbilical vessel catheterization,[4] immature immune status,[5] infection,[6-8] and hypertonic feedings[9] have all been implicated.

In the course of a series of nutritional studies involving thriving very-low-birth-weight infants