PAPERS AND ORIGINALS

Speech Defects in Children Aged 7 Years: A National Study

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Summary

A series of screening procedures applied on a national scale by doctors, teachers, and health visitors showed that between 10% and 13% of British 7-year-old children born in one week in 1958 were reported as having an appreciable degree of speech impairment. Between 1% and 2% had a marked speech defect though hearing normally. This latter group of speech-defective children were more often male and of poor family background, and more were born towards the end of a long family. They were often at a disadvantage educationally and had more clumsiness and defects of vision and visuomotor coordination than the rest of the sample. The methods used for screening provided a reliable guide in the selection of children who require further investigation.

Introduction

Disorders of speech and language in young children have only rarely been studied longitudinally and then in local rather than national samples (Morley, 1965; Fiedler *et al.*, 1971). The National Child Development Study (1958 cohort), being a longitudinal study starting at birth, provides a unique opportunity of assessing speech difficulties and their perinatal associations in a national sample of over 15,000 7-year-olds. Seven years is a convenient age to assess children for the presence of speech defects. Intelligible spoken language has usually been acquired by the age of 4 to 5 years, though a number of infantile phonetic substitutions may persist. By the age of 7 years the majority of such developmental mispronunciations have disappeared spontaneously. If they continue they tend to become "crystallized," and such children have been shown to manifest serious learning difficulties, especially in oral expression, reading, spelling, and written composition (Sheridan, 1948). The present report, after summarizing the national prevalence by sex and social class of speech difficulties reported at 7 years (Davie *et al.*, 1972), describes the educational and physical progress and the perinatal associations of normally-hearing children with marked speech defects at 7 years.

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Methodology

The National Child Development Study, sponsored by the National Children's Bureau (Pringle *et al.*, 1966; Davie *et al.*, 1972), is a longitudinal investigation of all children born in England, Scotland, and Wales from 3 to 9 March 1958. This was the week of the British Perinatal Survey of the National Birthday Trust Fund involving the births of 17,418 infants, of whom 16,750 survived the first week of life (Butler and Bonham, 1963; Butler and Alberman, 1969). Perinatal details were available on these children. At the age of 7 years educational, sociological, and medical schedules were completed on over 90% of those known to have been surviving at 4 weeks and still living in Britain. Identical follow-up data were obtained on a number of children (640), mainly immigrants, on whom perinatal details had not been recorded.

An *educational schedule* was completed by the head or class teacher, who also administered four short educational tests. More specifically, the teacher supplied information on 15,002 children on whether in the school situation there was any difficulty in understanding the child because of poor speech and, if so, whether the speech was "certainly" or "somewhat" difficult to understand.

A *sociological schedule* was filled in by health visitors, including past and current details about the child's progress, after interview with the parents; speech data, available on 14,539 children, included a history of any delay in talking, defined as inability to join two or more words together by the age of 2 years. The mother was also asked whether there was a past history of stammer, stutter, or other speech difficulty and, finally, if her child had ever received speech therapy. Since the maternal history is retrospective it must be interpreted with some caution.

Completion of a *medical schedule* was the responsibility of the school medical officer, based on medical history and a complete physical examination which included special tests and assess-

ments of speech, hearing, and vision (Davie *et al.*, 1972). This included a clinical speech test designed by one of us and completed on 14,064 children. The following test sentences were used.

Carol threaded a needle with wool.
She mended her sister's frock.
Roger grasped a bundle of sticks.
Eating porridge gives him strength.
My brother rode his bicycle to school.
Philip had scrambled eggs for breakfast.

These six test sentences covered most of the common vowels, single consonants, and clusters of consonants used in everyday English speech. Emphasis was placed on accurate repetition of these speech sounds and not on evaluation of memory or hearing. The child was asked to repeat the test sentences at a conversational distance facing the examiner. The latter recorded the number of errors and underlined any words mispronounced. Fewer than five mispronunciations was considered compatible with normal speech at this age. The medical officer was also asked to grade the child's speech into one of four categories—"fully intelligible," "almost all words intelligible," "many words unintelligible," or "almost all words unintelligible." He also recorded whether stammer was present and, if so, whether this was slight, moderate, or severe.

Results

Simple prevalences of reported speech difficulties and their associations with sex and social class are summarized below; detailed tables on these aspects have been published elsewhere (Davie *et al.*, 1972).

Speech Intelligibility.—Teachers reported that 10·7% of all children were difficult to understand because of poor speech. In 2·4% of all the children this was adjudged to apply "certainly"; there was a male preponderance (3% against 1·7%) and an increasing trend from social class I (0·7%) to social class V (5·9%). Doctors rated 13·5% of the children as having speech which was other than "fully intelligible." A much smaller proportion (1·4%) were reported as having "many" or "almost all" words unintelligible; here again there were twice as many boys as girls, and the prevalence increased steadily from social class I (0·6%) to social class V (3·4%).

Clinical Speech Test.—Ninety per cent. of children made four or fewer mispronunciations and were considered to have normal speech. Of the remainder 7% made five to nine mistakes and 3% 10 or more. More boys (3·6%) than girls (2·3%) made 10 or more errors, and a sixfold increase from social class I (1·1%) to social class V (6·2%) reflected a strong social trend.

Stammer.—This was reported by doctors in 162 children (1·1%), boys being twice as often affected as girls. In only two children, both boys, was the stammer graded as severe; 12 had a moderate stammer, and in the rest the stammer was slight. Stammer was significantly more often reported in children from working-class families. Past stammer or stutter was reported by parents in as many as 6·2% of the children. This excess of past stammerers was possibly a reflection of the susceptibility of young children to developmental "stammer of eagerness" (Ingram, 1972).

Speech Therapy.—About one in 40 children had already been seen by a speech therapist by 7 years. The ratio of boys to girls was 2:1. In contrast to the pronounced social class trend already reported in the speech test there was no such trend in the uptake of speech therapy (fig. 1). Geographical distribution of speech test results was also compared with uptake of speech therapy. Scotland reported at 7 years that a lower proportion of children than in England or Wales made five or more errors in the speech test. The proportion who had received speech therapy in Scotland was greater than in England or Wales and was nearly four times as high as in the North-west region of England, the region where the highest proportion of mispronunciations was recorded on the speech test. Five English regions reported that

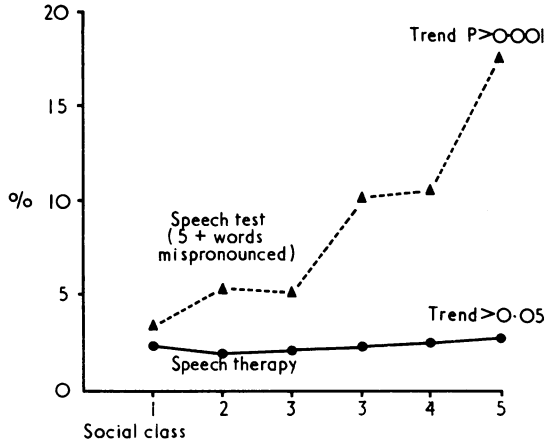

FIG. 1—Overall uptake of speech therapy service and proportion of children with poor results on clinical speech test according to social class (Registrar General's classification).

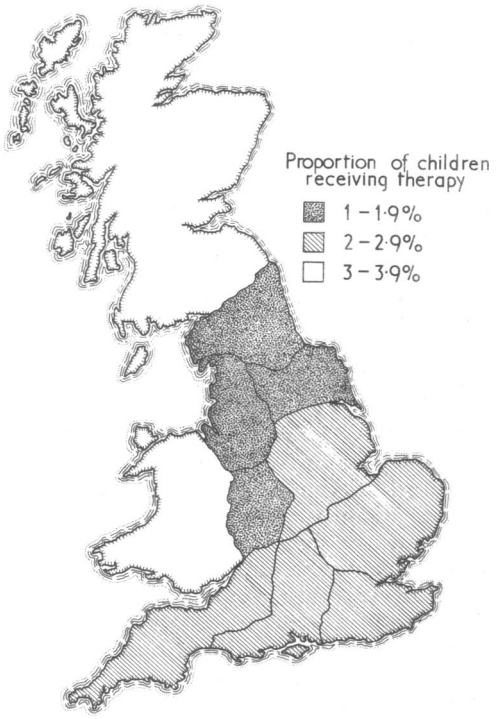

FIG. 2—Regional distribution of children receiving speech therapy in the first 7 years (National Child Development study).

over 10% made five or more errors on the clinical speech test; among these were the four regions with the lowest uptake of speech therapy by 7 years (fig. 2).

Marked Speech Defect in Normally-hearing Children.—A group of 7-year-old children with marked speech defect were selected for further analysis after elimination of all those children assessed on clinical or audiometric testing as having hearing disability. It should be stressed that the primary objective here was not to investigate aetiology but to identify through educational and medical channels a group of children needing help on account of their poor speech whatever their educational status. Therefore all children meeting the above criteria were included at this stage, whether or not ascertained as needing or receiving special education treatment, provided speech impairment was a marked feature and hearing could be assessed as normal. Special scrutiny of the data available on all three schedules was made by one of us (M.S.) on every normally-hearing child who was rated by the teacher as being "certainly" difficult to understand because of poor speech and who was also rated by the doctor as having "all" or "almost all" words unintelligible. In this way 215 children, or 1·6% of all 7-year-olds, could be designated as having marked speech defect with normal hearing.

These children showed a higher incidence of other types of speech defect and of lateness in speaking compared with the remainder of the sample (controls). Over a third (37%) had been late talkers compared with controls (5·5%). Yet only 28·6% of children with marked speech defect were reported by parents as ever having attended for speech therapy.

Developmental and School Progress.—One in six children (16·6%) had not walked alone by 18 months compared with the control figures of 4·1%, suggesting that a higher proportion of the children had shown other signs of developmental retardation. Indeed, by the age of 7 years 82 (38%) of this group of children were recognized to have educational difficulty; 33 (15%) of them were already receiving help at special schools. Of these 82 children 12 had been formally ascertained as severely subnormal, 14 as educational subnormal, and 7 were in special schools, five on account of physical handicap and two because of poor speech. The remaining 49 were in normal schools, 37 of whom were already receiving special remedial teaching by 7 years and 12 would have benefited from this in the opinion of their teachers. It is possible that in some instances the educational retardation could have accounted for at least a part of the speech defect, so some of the subsequent analyses have been carried out both on all children with marked speech defect and also on a smaller subgroup where marked speech defect was not accompanied by recognized educational retardation.

Perinatal Factors.—A higher proportion of children with marked speech defect had been born preterm (under 37 weeks) (table I). It is of interest that no difference was found between those with marked speech defect and controls in birth weight, either when subdivided into 500-g groups or when arranged as birth weight percentiles for each completed week of gestation. Bleeding in pregnancy, pre-eclampsia, long labour, abnormal method of delivery, or history of fetal distress were not encountered more frequently than in controls.

TABLE I—*Gestational Age in Normally-hearing Children with Marked Speech Defect at 7 Years*

Week of Gestation	Marked Speech Defect				Rest of Sample	
	A		B		C	
	No.	%	No.	%	No.	%
28-36	14	8·9	9	8·5	558	4·2
37-38	35	20·8	23	21·7	1,894	14·4
39-41	94	56·0	59	55·7	9,110	69·3
⩾42	24	14·3	15	14·1	1,584	12·0
Total	168	100·0	106	100·0	13,146	99·9

A = Whole group. B = Children with "educational difficulties" excluded.
χ^2 : A *v.* C = 18·15 (3 D.F.), P < 0·001; B *v.* C = 11·51 (3 D.F.), P < 0·01.

Sex.—Children with marked speech defects exhibited a striking male preponderance, there being 144 boys and 71 girls.

Birth Order.—Children with markedly poor speech were more often younger children in large families; conversely, fewer were first-born. As educational difficulty is known to increase with increasing birth order the 82 children with recognized educational difficulties were then excluded from the analysis. Table II shows that the difference was still highly significant. First-born children cared for at home by their mothers tend to hear adult speech almost exclusively in the preschool period. They are therefore at an advantage compared with later children of large families, who are mainly exposed to the less mature speech of siblings.

Social Class.—There was a significant trend towards a lower family social class among children with marked speech defect. A similar social class trend persisted when the 82 children with recognized educational difficulties were excluded (table III).

Visual Problems.—Impaired vision was defined as acuity on the Snellen test of 6/12 or worse in the better eye (Alberman *et al.*, 1971). This was three times as frequent among those with markedly defective speech as in controls. Actual or latent squint, present in 13%, was twice as common as in controls.

TABLE II—*Position in Family of Normally-hearing Children with Marked Speech Defect at 7 Years*

Position in Family	Marked Speech Defect				Rest of Sample	
	A		B		C	
	No.	%	No.	%	No.	%
Eldest or only	41	21·2	24	20·0	5,507	38·2
2nd or 3rd	85	44·0	52	43·3	7,025	48·7
4th or 5th	43	22·3	29	24·2	1,471	10·2
6th or more	24	12·4	15	12·5	415	2·9
Total	193	99·9	120	100·0	14,418	100·0

A = Whole group. B = Children with "educational difficulties" excluded.
χ^2 : A *v.* C = 99·97 (3 D.F.), P < 0·001; B *v.* C = 70·81 (3 D.F.), P < 0·001.

TABLE III—*Occupation of Fathers of Normally-hearing Children with Marked Speech Defect at 7 Years*

Social Class	Marked Speech Deficit				Rest of Sample	
	A		B		C	
	No.	%	No.	%	No.	%
Professional ..	3	1·6	2	1·7	741	5·2
Managerial ..	17	8·8	9	7·6	2,055	14·4
Skilled Non-manual	11	5·7	8	6·8	1,395	9·8
Skilled manual ..	82	42·5	55	46·6	6,331	44·3
Semi-skilled ..	47	24·4	26	22·0	2,482	17·4
Unskilled	27	14·0	13	11·0	904	6·3
No male head ..	6	3·1	5	4·2	394	2·8
Total	193	100·1	118	99·9	14,302	100·2

A = Whole group. B = Children with "educational difficulties" excluded.
χ^2 : A *v.* C = 35·23 (6 D.F.), P < 0·001; B *v.* C = 14·15 (6 D.F.), P < 0·05.

Social Adjustment.—A Bristol social adjustment guide (B.S.A.G.; Stott, 1958) was completed by teachers on each child. Table IV shows that behaviour difficulties in the school situation, as judged by this test, were more common among children with markedly defective speech. Nearly half produced scores considered by Stott to indicate "maladjustment," an incidence nearly four times that in the controls. In the opinion of the teachers overdependence on the mother (39%) was over twice as frequent as in the controls (18%).

TABLE IV—*Social Adjustment (B.S.A.G. Score) in Normally-hearing Children with Marked Speech Defect at 7 Years*

Score	Marked Speech Defect		Rest of Sample	
	No.	%	No.	%
Stable: 0-9	47	23·0	9,522	64·4
Unsettled: 10-19	60	29·4	3,269	22·1
Maladjusted: 20-29	67	32·8	1,491	10·1
30	30	14·7	496	3·4
Total	204	99·9	14,778	100·0

χ^2 = 232·8063 (3 D.F.), P < 0·001.

Physical Co-ordination.—Nearly half of the children with marked speech defect were considered by their teachers to show some degree of clumsiness, a situation nearly three times as common as in the controls (table V). This result was not substantially altered after exclusion of the 82 children with recognized educational difficulty.

Educational Attainments.—The results of individual teacher ratings and of test scores were compared with controls. One-third (32·4%) of children with marked speech defect were considered to be non-readers, compared with 2·8% of the controls. In fact, only two of the whole group of children with marked speech defect were assessed as showing reading ability above average, compared with 31% of the controls (table VI). Ratings of number work followed a similar pattern; 32·1% against 3·5%

TABLE V—*Clumsiness (Teacher Rating) in Normally-hearing Children with Marked Speech Defect at 7 Years*

Whether Clumsy	Marked Speech Defect				Rest of Sample	
	A		B		C	
	No.	%	No.	%	No.	%
Certainly	33	15·9	15	11·4	289	2·0
Somewhat	63	30·4	37	28·0	1,598	10·9
Not	111	53·6	80	60·6	12,804	87·2
Total	207	99·9	132	100·0	14,691	100·1

A = Whole group. B = Children with "educational difficulties" excluded.
χ^2 : A *v.* C = 269·41 (2 D.F.), $P < 0.001$; B *v.* C = 58·78 (2 D.F.), $P < 0.001$.

TABLE VI—*Reading Ability (Teacher Assessment) in Normally-hearing Children with Marked Speech Defect at 7 Years*

Reading Ability	Marked Speech Defect				Rest of Sample	
	A		B		C	
	No.	%	No.	%	No.	%
Above average	2	0·9	2	1·5	4,583	30·9
Average	27	12·7	22	16·7	6,452	43·5
Poor	115	54·0	89	67·4	3,368	22·7
Non-reader	69	32·4	19	14·4	416	2·8
Total	213	100·0	132	100·0	14,819	99·9

A = Whole group. B = Children with "educational difficulties" excluded.
χ^2 : A *v.* C = 770·79 (3 D.F.), $P < 0.001$; B *v.* C = 232·72 (3 D.F.), $P < 0.001$.

of controls having little or no ability in this sphere (table VII). In a copying-designs test children with marked speech defect showed an eightfold increase of poor results (score 0, 1, or 2), suggesting that they may also have had visuospatial difficulties (table VIII). Similarly, a low score was more often recorded in the "draw-a-man" test (Harris's modification of the Goodenough test; Harris, 1963) (table IX). Poor speech could itself occur as a result of mental subnormality. It was therefore important to repeat some of the comparisons of educational attainment after excluding the 82 children with recognized educational difficulties. Among the remaining 133 children there was still a highly significant increase compared with controls in the proportion of children rated as below average in reading ability or in number

TABLE VII—*Number Work (Teacher's Assessment) in Normally-hearing Children with Marked Speech Defect at 7 Years*

Number Work	Marked Speech Defect				Rest of Sample	
	A		B		C	
	No.	%	No.	%	No.	%
Above average	5	2·4	5	3·8	3,151	21·2
Average	38	17·9	32	24·4	6,513	43·9
Poor	101	47·6	73	55·7	4,659	31·4
Little concept	68	32·1	21	16·0	514	3·5
Total	212	100·0	131	99·9	14,837	100·0

A = Whole group. B = Children with "educational difficulties" excluded.
χ^2 : A *v.* C = 527·75 (3 D.F.), $P < 0.001$, B *v.* C = 113·52 (3 D.F.), $P < 0.001$.

TABLE VIII—*Copying-Design Test in Normally-hearing Children with Marked Speech Defect at 7 Years*

Score	Marked Speech Defect				Rest of Sample	
	A		B		C	
	No.	%	No.	%	No.	%
0-2	32	16·0	6	4·8	277	1·9
3-5	68	34·0	36	28·6	2,702	18·6
6-8	90	45·0	74	58·8	8,067	55·7
9-11	10	5·0	10	7·9	3,442	23·8
Total	200	100·0	126	100·1	14,488	100·0

A = Whole group. B = Children with "educational difficulties" excluded.
χ^2 : A *v.* C = 244·35 (3 D.F.), $P < 0.001$; B *v.* C = 25·25 (3 D.F.), $P < 0.001$.

TABLE IX—*Draw-a-Man Test in Normally-hearing Children with Marked Speech Defect at 7 Years*

Score	Marked Speech Defect				Rest of Sample	
	A		B		C	
	No.	%	No.	%	No.	%
0-4	11	5·5	0	0·0	20	0·1
5-9	18	9·0	8	6·3	163	1·1
10-14	49	24·5	24	18·7	1,055	7·3
15-19	59	29·5	43	33·6	2,791	19·3
20-24	36	18·0	30	23·4	3,889	26·9
25-29	16	8·0	14	10·9	3,253	22·5
30-34	5	2·5	4	3·1	2,275	15·7
35-39	6	3·0	5	3·9	822	5·7
⩾40	—	—	—	—	195	1·3
Total	200	100·0	128	99·9	14,463	99·9

A = Whole group. B = Children with "educational difficulties" excluded.
χ^2 : A *v.* C = 507·26 (8 D.F.), $P < 0.001$; B *v.* C = 87·12 (8 D.F.), $P < 0.001$.

work or who scored a poor result in the copying-design test or in the "draw-a-man" test (tables VI-IX). Could these adverse educational attainments be merely a reflection of the lower social class distribution among those with marked speech defects? The distribution of the above educational ratings and test results was therefore re-examined for children with marked speech defect and compared with controls separately within three social class groups (non-manual, social class III manual, and social classes IV and V). In each class children with marked speech defects showed significantly worse ratings or test scores than did the rest of the sample.

Discussion

The results of this study show that screening for severe speech defect is feasible in the school situation at 7 years, though by this age many speech problems already existed or persisted, as shown by the results of tests and assessments. Moreover, these needs were clearly not being fully met by the referral rate of 1 in 40 of all children for speech therapy by 7 years of age. Methods employed in the present survey were essentially practical screening procedures designed to be used by teachers and school medical officers. The teachers' evaluation, based on day-to-day observation in school of the child's understanding and use of language, proved comparatively simple to obtain. The clinical speech test was used successfully by school medical officers all over the country, proving itself potentially valuable as a means of screening children and worthy of further investigation.

Our findings at 7 years support the general view that it would be preferable to institute screening procedures before the age of 7, and the question arises of how early children with severe speech defect can be reliably screened out with a view to further investigation. There seems to be no reason why teacher's report and doctor's test should not be carried out as part of a routine procedure soon after school entry, though this would require further piloting. All children thus screened out could then be investigated further and if necessary referred to a speech therapist. In view of the high proportion of associated defects found in children with speech problems in this study it is essential to arrange comprehensive assessment, which must include full visual, auditory, and neurological evaluation. This presupposes an adequate provision of medical and paramedical personnel, including audiometricians and, above all, speech therapists. There is an unequal distribution of speech therapists in Britain, with a recognized shortage in many areas. This study has confirmed a geographical variation in attendance rates for speech therapy, a variation which did not always correspond with the "needs," as shown, for instance, by the results of the speech test. In all areas, however, a greater need was indicated in children from the manual social class background, as shown by their poorer performance on the clinical speech test and teacher ratings. Yet the absence of any social class difference in the

uptake of speech therapy throughout Britain suggests that families of lower social class are making worse use of the speech therapy provisions available in their vicinity.

Detailed analysis was made of a high-risk group of children, comprising 1·6% of all the 7-year-olds, who were considered to have a marked speech defect in the absence of any auditory difficulty after evaluation of a large amount of data available on speech and hearing from doctor, teacher, and health visitor and assessment of test results. Even though this was clearly a very handicapped group not more than a third were reported as having been referred by 7 years for speech therapy. It would have been interesting to have considered these children under aetiological headings, but the absence of specialized tests to assist differential diagnosis inevitably led to the bracketing of many different conditions under the heading of marked speech defect. These included true language disorders and dysarthrias of every type, as well as late-resolving developmental phonetic substitutions which would normally have disappeared spontaneously by the age of 7 years. Nevertheless, when considered as a group these children did manifest a number of important sociobiological characteristics. These children, more often males, came from a poorer social background and were of later birth order than controls. Apart from aetiological considerations such findings help to define the type of child worthy of further investigations of their speech problems. The children more often showed other disabilities, such as visual defect or squint, emphasizing the need for searching for other handicaps. They were more often rated as being clumsy by their teachers, perhaps indicating that a proportion might be associated with neurodevelopmental dysfunction. Perinatal factors were sought, but apart from the tendency for these children to be born before term abnormalities of pregnancy or labour were not found to be significantly more common than in controls.

Over a third of the children with marked speech defect were recognized by 7 years of age to have educational difficulties. It was not unexpected, therefore, that the whole group showed a poorer performance on teachers' ratings as well as on tests of visuomotor ability and social adjustment. When the 82 children with recognized educational difficulties were excluded, on the grounds that educationally backward children often have poorly developed speech, the remaining 60% of children with marked speech defect still performed unsatisfactorily in the majority of the tests compared with controls. Clearly many children in normal schools with speech defects have an educational problem at 7 years which requires special consideration. The educational complications and possible lines of therapy should always initially be discussed with the child's teacher.

On the evidence available from these results there can be no question that children with speech defects at 7 years need and should be urgently provided with expert treatment and follow-up by speech therapists, not working in isolation but in conjunction with paediatricians, psychologists, psychiatrists, teachers, and parents.

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Early Mobilization after Myocardial Infarction: a Controlled Study

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Summary

During the years 1968-71 203 patients with proved myocardial infarction were admitted to the trial. Patients were mobilized either on day 10 (102 patients) or on day 20 (100 patients). All patients were kept in hospital for 30 days in order to ensure a detailed comparison of clinical course and laboratory data. In neither group was there a fatal complication and the differences in clinical outcome or laboratory data were statistically not significant. Half of the patients from each group were re-examined after an average of one-and-a-half years, and again no differences were observed. It is concluded that patients with an uncomplicated myocardial infarction may safely be mobilized after 9 days and discharged after three weeks.

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Introduction

Patients who sustain a myocardial infarction traditionally face a fixed period of bed rest, usually amounting to six weeks, irrespective of the severity of their condition. In recent years, however, a small degree of mobilization has been advocated as