

Primary care

Providing child safety equipment to prevent injuries: randomised controlled trial

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Abstract

Objective To assess the effectiveness of safety advice and safety equipment in reducing unintentional injuries for families with children aged under 5 years and living in deprived areas.

Design Randomised controlled trial.

Setting 47 general practices in Nottingham.

Participants 3428 families with children under 5.

Intervention A standardised safety consultation and provision of free and fitted stair gates, fire guards, smoke alarms, cupboard locks, and window locks.

Main outcome measures Primary outcome measures were whether a child in the family had at least one injury that required medical attendance and rates of attendance in primary and secondary care and of hospital admission for injury over a two year period. Secondary outcome measures included possession of safety equipment and safety practices.

Results No significant difference was found in the proportion of families in which a child had a medically attended injury (odds ratio 1.14, 95% confidence interval 0.98 to 1.50) or in the rates of attendance in secondary care (incidence rate ratio 1.02, 0.90 to 1.13) or admission to hospital (1.02, 0.70 to 1.48). However, children in the intervention arm had a significantly higher attendance rate for injuries in primary care (1.37, 1.11 to 1.70, $P=0.003$). At both one and two years' follow up, families in the intervention arm were significantly more likely to have a range of safety practices, but absolute differences in the percentages were relatively small.

Conclusions The intervention resulted in significant improvements in safety practices for up to two years but did not reduce injuries that necessitated medical attendance. Although equipment was provided and fitted free of charge, the observed changes in safety practices may not have been large enough to affect injury rates.

Introduction

Primary healthcare teams have an important contribution to make to the prevention of unintentional injuries in children. However, there is little evidence in the United Kingdom that they can be effective in reducing them. Systematic reviews have found that home safety counselling or education, with or without the provision of safety equipment, can increase the use

of some items of safety equipment and improve safety behaviours in the short term, but the effect on unintentional injury is less clear.¹⁻⁴ Many of the trials were conducted in the United States, which limits generalisability to UK settings. There is also a lack of high quality randomised controlled trials.

The high cost of safety equipment and the difficulty of installing it have been identified as barriers to families implementing advice on home safety.³ No trials have examined the provision and fitting of equipment free of charge.

We report the main results of a randomised controlled trial assessing the effectiveness of an intervention in increasing safety practices and reducing unintentional injuries in families with children aged under 5 years, living in deprived areas.

Methods

Participants

All health visitors working in practices from deprived areas in Nottingham Health Authority (78 health visitors and 60 practices) received an invitation to take part in the study, and 62 health visitors from 47 practices participated.

Our study population comprised families with one or more children younger than 5 years from the caseloads of participating health visitors. We did not invite families in which one or more children were on the Child Protection Register or a child had experienced a fatal unintentional injury.

Interventions

The intervention comprised a standardised consultation by a health visitor individualised and specific to the children's ages in each family.

The health visitors offered stair gates, fire guards, smoke alarms, cupboard locks, and window locks free of charge to low income families in the intervention arm, and these were fitted free of charge. We defined low income families as those receiving means tested benefits. Families not on a low income were offered equipment at cost price and a delivery service to their home.



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Table 1 Injury outcomes for injuries at the level of the family or child, at 24 months' follow up, by treatment arm

| Injury outcomes | Intervention arm | | | | Control arm | | | | Effect size (95% CI) | |
|---|------------------|-------------|------------------------|--------------|-------------|-------------|------------------------|--------------|----------------------|-------------------------------|
| | No (%) | Denominator | Rate/1000 person years | Person years | No (%) | Denominator | Rate/1000 person years | Person years | Odds ratio (95% CI) | Incidence rate ratio (95% CI) |
| At family level: | | | | | | | | | | |
| Child in family had medically attended injury | 593 (40.5) | 1463 | — | — | 574 (37.5) | 1532 | — | — | 1.14 (0.98 to 1.50) | — |
| Phoned NHS Direct after an injury* | 77 (10.0) | 769 | — | — | 67 (9.3) | 719 | — | — | 1.08 (0.76 to 1.52) | — |
| Attended walk-in centre after an injury* | 29 (3.8) | 767 | — | — | 28 (3.9) | 712 | — | — | 0.94 (0.53 to 1.60) | — |
| At child level: | | | | | | | | | | |
| Primary care attendance | 220 | — | 61.2 | 3595.1 | 172 | — | 44.2 | 3887.7 | — | 1.37 (1.11 to 1.70) |
| Secondary care attendance | 685 | — | 175.9 | 3895.0 | 743 | — | 174.1 | 4267.8 | — | 1.02 (0.90 to 1.13) |
| Hospital admission | 54 | — | 13.9 | 3895.0 | 58 | — | 13.6 | 4267.8 | — | 1.02 (0.70 to 1.48) |
| Abbreviated injury scale ≥ 2 | 57 (12.1) | 472 | — | — | 49 (10.8) | 456 | — | — | 1.14 (0.76 to 1.71) | — |
| Minor injury severity score ≥ 2 | 215 (45) | 478 | — | — | 206 (45.3) | 455 | — | — | 0.98 (0.75 to 1.27) | — |

*Self reported on 24 month follow up questionnaire.

Families randomised to the control arm received usual care. They did not have access to the research documentation, free or low cost safety equipment, or the fitting scheme.

Outcome measures

Primary outcome measures were whether a child in the family had at least one medically attended injury and the rates of attendance in primary and secondary care and of hospital admission for injury during the two year follow up period. We obtained these data from the primary and secondary care records for all children aged under 5 at the start of the trial and for new births during the study period. Secondary outcome measures included severity of injury assessed from primary and secondary care records. We assessed possession of safety equipment, safety practices, self reported injury, and satisfaction with the intervention, at 12 and 24 months' follow up by two postal questionnaires to separate random samples of 1000 families from each treatment arm. We validated responses to the 12 month questionnaire. We obtained baseline data on sociodemographic characteristics, possession of safety equipment, and safety practices from a postal questionnaire. We assessed satisfaction among health visitors with the intervention by postal questionnaire at the end of the intervention period.

Randomisation and blinding

Randomisation took place after the baseline questionnaires had been returned. We stratified participants by health visitor and randomised them to treatment arms.

It was not possible to blind participants, and health visitors were aware of which clients were in the intervention arm, but they were not provided with a list of controls so contamination was minimised. We kept outcome assessors blind to the treatment arm of the families.

Sample size and statistical analysis

We estimated that a sample size of 3400 families, 1700 in each arm, would give 80% power to detect at the 5% significance level a relative reduction of 10% in medically attended injuries between treatment arms.

We used multilevel logistic regression to compare whether at least one child in the family had one or more medically attended injuries and whether family safety practices varied between treatment arms. We compared injury rates using multilevel Poisson regres-

sion and examined the effect of compliance by comparing outcomes of participants in the intervention arm with those in the control arm. We studied interactions between the intervention and family income and child age (see bmj.com).

Results

We recruited 3428 families (3995 children) between January and May 2000, with 1711 families in the intervention arm and 1717 families in the control arm. The follow up period started on 1 June 2000 and ended on 31 May 2002. The treatment arms were well balanced at baseline (see bmj.com).

A total of 1163 (68%) families in the intervention arm received the safety consultation, and 619 families (36%) had free equipment fitted, and 26 (1.5%) bought equipment at low cost. The attendance rate for injury in primary care was higher (by 37%) for children in the intervention than in the control arm ($P=0.003$) (table 1). We found no evidence that the effect of the intervention varied by family income or child age for any of the primary outcome measures ($P>0.1$ for all interaction terms). A compliance analysis found similar results to the primary analysis, with a higher injury attendance rate in primary care in children in the intervention arm who received the safety consultation than in children in the control arm (incidence rate ratio 1.50, 95% confidence interval 1.21 to 1.88) but no difference in rates of attendance in secondary care or admission to hospital.

Table 2 shows that at one year and two years, families in the intervention arm were significantly more likely to have a range of safety practices. Absolute differences in the percentages of families with safety practices were relatively small—none exceeded 10%.

Among families responding to the 12 month questionnaire, 89% (286/322) of those receiving equipment agreed or strongly agreed that they were satisfied with the safety equipment, and 70% (411/589) of families who received the consultation agreed or strongly agreed that they were satisfied with the health visitor's advice. Ninety five per cent (53/56) of responding health visitors agreed or strongly agreed that the safety consultation should be used in routine practice.

Table 2 Prevalence of safety practices at 12 and 24 months' follow up, by treatment arm. Values are numbers (percentages) of families unless otherwise indicated

| Safety practices | 12 months' follow up | | | 24 months' follow up | | |
|-----------------------------------|---------------------------|----------------------|---------------------|---------------------------|----------------------|---------------------|
| | Intervention arm (n=771)* | Control arm (n=744)* | Odds ratio (95% CI) | Intervention arm (n=803)* | Control arm (n=754)* | Odds ratio (95% CI) |
| Fitted and always used fire guard | 414 (54.3) | 374 (50.9) | 1.14 (0.93 to 1.40) | 328 (42.1) | 299 (40.0) | 1.09 (0.88 to 1.33) |
| Fitted and used stair gate | 408 (55.0) | 328 (45.7) | 1.46 (1.19 to 1.80) | 239 (30.1) | 240 (31.9) | 0.92 (0.74 to 1.14) |
| Fitted and working smoke alarm | 692 (90.6) | 619 (84.0) | 1.83 (1.33 to 2.52) | 728 (91.5) | 648 (86.5) | 1.67 (1.21 to 2.32) |
| Fitted window locks | 550 (71.7) | 493 (66.5) | 1.28 (1.02 to 1.59) | 577 (72.4) | 525 (70.0) | 1.12 (0.90 to 1.40) |
| Safe storage† | | | | | | |
| Medicines in kitchen | 712 (93.4) | 683 (92.6) | 1.15 (0.76 to 1.73) | 765 (95.5) | 701 (93.2) | 1.55 (1.00 to 2.40) |
| Cleaning products in kitchen | 496 (65.5) | 428 (58.6) | 1.34 (1.09 to 1.66) | 442 (55.3) | 365 (48.5) | 1.31 (1.07 to 1.60) |
| Sharp objects in kitchen | 346 (45.4) | 279 (38.2) | 1.34 (1.09 to 1.65) | 296 (36.9) | 262 (34.8) | 1.10 (0.91 to 1.32) |
| Cleaning products in bathroom | 493 (70.4) | 463 (68.5) | 1.09 (0.87 to 1.38) | 497 (63.1) | 459 (61.7) | 1.06 (0.86 to 1.31) |
| Sharp objects in bathroom | 545 (81.2) | 505 (78.3) | 1.20 (0.92 to 1.57) | 568 (73.2) | 548 (75.1) | 0.91 (0.72 to 1.14) |

*Denominators for percentages are those with valid responses.

†Defined as stored at adult eye level or above or in locked cupboards.

Discussion

A safety consultation with a health visitor and provision of free or low cost safety equipment, fitted in the homes of families with children under 5, resulted in significantly more families in the intervention arm having a range of safety practices for up to two years. However, children in the intervention arm did not have a lower rate of injuries that required medical attendance.

Limitations of the study

Only 35% of eligible families invited to participate in the trial did so. Although this is not a particularly low recruitment rate for a trial set in a deprived area, it may limit the generalisability of our findings as participants may have been families most motivated to make their homes safer.

It was not possible to keep health visitors completely blind to the identity of families in the control arm. However, this is unlikely to explain our findings; firstly, we measured the provision of safety advice in routine child health clinics before and after the trial started and did not find an increase; secondly, the fitting of equipment should have reduced the

potential for its transfer between families in the two treatment arms; and thirdly, increases in possession and use of safety equipment in the control arm over the two year follow up period were small.

Our inability to blind families participating in the study may have led to differential over-reporting of safety practices, but our use of validated questions on safety practices should have minimised this. In addition, the primary outcome measures were not self reported but ascertained by blinded assessors.

Finally, 548 (32%) intervention arm families did not receive the safety consultation, and only 645 (38%) received safety equipment. This will have limited the potential for the intervention to show an effect. However, the compliance analysis found similar results to the main analysis, implying that families who had the consultation had similar injury rates to those who did not.

Strengths of the study

Our study was adequately powered to detect a 10% reduction in medically attended injuries; allocation concealment was adequate; and we used an intention to treat analysis.

To our knowledge this trial had a longer follow up period than previous studies and achieved follow up on a high proportion of families. We used home observation to validate the questions used to measure self reported safety practices and found the questions to have high sensitivity and specificity. Importantly, both the families who had the intervention and the health visitors who delivered reported high degrees of satisfaction with the safety consultation.

Comparison with other studies

Our findings are consistent with previous systematic reviews in terms of possession and use of safety equipment, safety practices, and injury outcomes.¹⁻⁴ Only three previous studies that provided free or discounted safety equipment in a clinical setting have used occurrence of injury as an outcome measure. One trial found a reduction in self reported injuries,⁵ but none found a reduction in medically attended injuries, ascertained from medical records.⁵⁻⁷

Interpretation of the findings

The increased possession and use of safety equipment among families in the intervention arm did not translate into a lower injury rate. A higher than expected number of families living in a deprived area possessed

What is already known on this topic

Unintentional injury is the main cause of death in childhood and a major cause of ill health and disability

There is a paucity of evidence on the effectiveness of primary care professionals in providing safety advice and equipment

What this study adds

Advice that includes the offer of free home safety equipment, fitted free of charge, can improve safety practices of families living in deprived areas, for up to two years

Larger differences in safety practices may be required to affect injury rates

Even when equipment was provided and fitted free of charge, one third of families did not take advantage of this offer

safety equipment at baseline. Consequently, the absolute differences between treatment arms in the percentages of families with safety practices were relatively small, and a greater difference in safety practices may be required to affect the occurrence of injury. It is also possible that safety practices are not associated with reduced injury rates, but this is less plausible as several observational studies have shown a lower risk of injury among people with a range of safety practices.

Several explanations are possible for the higher attendance rate in primary care among intervention arm children. Firstly, participation in the intervention arm of the trial may have raised parents' awareness and changed their consulting behaviour for more minor injuries. Secondly, risk compensation⁸ may have occurred.

Implications for injury prevention practice and future research

Our findings in relation to safety practices and degrees of satisfaction are encouraging. However, our findings also highlight the importance of rigorously evaluating the widespread provision of equipment not only in terms of safety practices but also in terms of injury outcomes and uptake of schemes by those most at risk. Very large trials are required, or well designed case-control studies or cohort studies to examine the protective effect of specific items of equipment, followed by randomised controlled trials.

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Complicity

After qualification and the obligatory two house jobs, I had been called up for national service in the Royal Army Medical Corps. In 1958 I was in Cyprus with a small team at a medical centre and living in the mess of an infantry battalion. It was August, very hot, and Eoka snipers were shooting at us; not at me personally, but on occasion I had to administer to those who had been shot or peppered with shrapnel from a pencil bomb. Apart from this, life was pleasant: work in the morning, a very strong gin and tonic at lunchtime (the duty-free gin being very cheap and the tonic extremely expensive), a siesta, and an evening of conversation and developing friendship with the men who were actually out there being shot at.

Sometimes the afternoon was interrupted by a telephone call prefaced by a bizarre military codeword; one I remember was "flying duck." There were two types of call: one involved a long drive in the Landrover (with armed escort) to some remote hill village, there to decide whether an aged parent was sufficiently near to death that a visit from an imprisoned Eoka suspect son was warranted. This was almost impossible to determine, so the answer was invariably yes.

Far more disturbing was the call to the nearby police station. There I found four or five burly policemen, who regarded me with bored and slightly hostile contempt, and two very frightened young Cypriots. The question was whether they were fit for "further questioning." They had a number of injuries, mainly

bruising but some apparent joint damage. These were, I was told, a result of "resisting arrest." Standing in a bare room in rather threatening surroundings, my examination was not even adequate. I persuaded myself that one might have a broken rib and the other a shoulder injury and that both required x ray examination at the hospital.

It was not heroic. Yes, I was intimidated, but also the camaraderie of the previous three weeks under threat as against the clear suggestion of physical abuse made me ambivalent about both police and prisoners.

It was, as these things go, a trivial incident, but when I hear of medical complicity in torture I know how easy it would be to be drawn in and how difficult then to get free.

John Dewhurst *retired pharmaceutical physician and former principal in general practice, Finchampstead*

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