Long term effects of a home visit to prevent childhood injury: three year follow up of a randomized trial

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Objective: To assess the long term effect of a home safety visit on the rate of home injury.

Design: Telephone survey conducted 36 months after participation in a randomized controlled trial of a home safety intervention. A structured interview assessed participant knowledge, beliefs, or practices around injury prevention and the number of injuries requiring medical attention.

Setting: Five pediatric teaching hospitals in four Canadian urban centres.

Participants: Children less than 8 years of age presenting to an emergency department with a targeted home injury (fall, scald, burn, poisoning or ingestion, choking, or head injury while riding a bicycle), a non-targeted injury, or a medical illness.

Results: We contacted 774 (66%) of the 1172 original participants. A higher proportion of participants in the intervention group (63%) reported that home visits changed their knowledge, beliefs, or practices around the prevention of home injuries compared with those in the non-intervention group (43%; p<0.001). Over the 36 month follow up period the rate of injury visits to the doctor was significantly less for the intervention group (rate ratio = 0.74; 95% CI 0.63 to 0.87), consistent with the original (12 month) study results (rate ratio = 0.69; 95% CI 0.54 to 0.88). However, the effectiveness of the intervention appears to be diminishing with time (rate ratio for the 12–36 month study interval = 0.80; 95% CI 0.64 to 1.00).

Conclusions: A home safety visit was able to demonstrate sustained, but modest, effectiveness of an intervention aimed at improving home safety and reducing injury. This study reinforces the need of home safety programs to focus on passive intervention and a simple well defined message.

Home visiting programs promote child health and development for a broad range of outcomes. Evidence from a systematic review of eight randomized trials suggests that home visiting programs are able to reduce the rate of childhood injuries. The results of our own randomized controlled trial, published after Roberts et al's review, provides additional evidence of the effectiveness of these programs. However, debate continues over whether a home visit program has an actual impact on parent safety practices.

Injuries are the leading cause of death and a significant cause of morbidity in childhood. Children under the age of 15 years are more likely to experience an injury in the home than in any other setting, with many of these injuries related to a lack of appropriate safety measures. Falls, suffocation, burns, and poisoning are among the most common and serious of potential hazards in the home. Prevention efforts, such as home visiting programs directed towards the reduction of household hazards, should be evaluated and—if successful—widely implemented.

We have previously demonstrated that a single home visit decreased the occurrence of home injuries. We recontacted the participants of that study to examine the factors that contributed to its success and to explore whether the home visit had sustained effectiveness.

METHODS

In 1999, a follow up telephone survey of the families that participated in a multicentre, randomized controlled trial ending in 1997 was conducted. The trial sites were five pediatric teaching hospitals in four Canadian urban centres: the Montreal Children’s Hospital, Montreal, Quebec, Hôpital Ste Justine, Montreal, Quebec, IWK Health Centre, Halifax, Nova Scotia, the Children’s Hospital of Eastern Ontario, Ottawa, Ontario, and the Winnipeg Children’s Hospital, Winnipeg, Manitoba. The research ethics committees of each institution approved the study protocol.

The sample

The original sample consisted of children less than 8 years of age presenting to the emergency departments of each hospital. Participants were identified using emergency department logs and the Canadian Hospitals Injury Reporting and Prevention Program of the Health Protection Branch, Health Canada. Participant eligibility, recruitment, and the trial intervention have been previously documented. In brief, a research assistant performed a home visit and made specific, structured observations regarding the presence/absence of the following home safety hazards:

- access by children to small objects, matches, lighters, cleaning supplies, beauty supplies, medications, or electrical cords;
- windows which open easily beyond six inches;
- child resistant caps on medicines;
- tap water >130°F;
- a functioning smoke detector on each house level;
- a fire extinguisher;
- safety gates at stairs;
- a baby walker;
- ease of opening basement door;
- certified bicycle helmets; child seat restraints; and
- by report only, the failure to use bicycle helmets and automobile restraints at all times.
After the observations were completed, the home visitor administered a questionnaire regarding parental knowledge and awareness of injuries, the child’s history of past injuries requiring medical treatment, and the number of injuries involving other children in the family. After all the above measures were completed, a further informed consent for the randomized controlled trial was obtained. Children were randomized by the following method: an equal number of intervention and non-intervention identification cards were placed in sealed envelopes, mixed in an opaque container, sequentially numbered as they were withdrawn, and distributed in aliquots to each study site. Each home was assigned to one of two groups. Parents in the intervention group received: (1) a specific home injury prevention information package; (2) review of the visit findings and instruction on how to correct identified safety deficiencies; (3) detailed instructions regarding each of the targeted injuries, with demonstrations of the appropriate use of safety device(s); (4) coupons from a national retail store (Canadian Tire) for a $10 discount per item (to a maximum of $50) when purchasing recommended safety devices. Parents of children in the non-intervention group received a general safety information pamphlet. In the initial study, participants were contacted by telephone at four and eight months, and at one year a research assistant blinded to the intervention assignment completed a home safety inspection.

For this study, participants were contacted by telephone (minimum of five attempts) 36 months after the initial home visit by a research assistant blinded to the intervention assignment. A structured interview was performed that asked the following questions:

1. Since the last home visit, have any of your children seen a doctor or gone to the emergency department because of an injury? Details of the injury occurrence were collected.
2. Since the last home visit, have you made any changes to make your home safer?
3. Which of the following had the greatest impact on your knowledge and practices around the prevention of home injuries? Please choose one only of the following: participation in this study; media sources (magazines, TV, radio, etc); advice from family or friends; your family doctor; other: specify.
4. How much did each of the following items (coupons, home visits, pamphlets, phone calls) change your knowledge, beliefs, or practices around the prevention of home injuries?
5. Please answer the following questions using a scale from 1 to 10, where 1 is not at all and 10 is very much:
   - How preventable do you think most children’s injuries are?
   - How much control do you think you have to decrease the risk of your child having an accident?
6. Do you have any comments about how the study was conducted or any feedback you would like to give us?

Statistical analysis

Participants’ characteristics, including injury awareness and knowledge, were compared between intervention groups using the Wilcoxon rank sum test for ordinal or interval scale variables and Pearson’s $\chi^2$ test for categorical variables. Similarly, we compared dropouts and completers for any differences in their baseline characteristics. Injury knowledge and awareness were compared between intervention groups using Pearson’s $\chi^2$ test. We evaluated the extent to which the intervention decreased the frequency of injury requiring a physician visit by comparing injury frequency between intervention groups using Pearson’s $\chi^2$ test. We then derived the ratio of injury per person year assuming a Poisson distribution for the number of injuries.

RESULTS

Participant characteristics

Baseline characteristics of the participants have been described elsewhere.$^1$ We were able to contact 774 of 1172 participants (66%) for follow up (fig 1) with equal representation of the original intervention (67%) and control (65%) groups. Participant characteristics are given in table 1 (see http://www.injuryprevention.com/supplemental). The median age in both groups was 2 years, with males comprising 60%. At the three year follow up, the groups were comparable in terms of age, sex, intervention, and socioeconomic status. Families who did not complete the follow up study had: (1) significantly younger parents; (2) younger age at which mother had her first child, and (3) fewer years of minimum parental education compared with those who completed the trial ($p<0.001$, table 1). There was no difference within the intervention and control groups for those who completed the study compared with those who did not.

Injury knowledge and practices

Seventy three percent of participants in both groups correctly identified injury as the leading cause of death in children under 8 years and median scores for the perception of injury preventability were 8 (out of 10) for the intervention and control groups (tables 2 and 3). The median score for perceived control over decreasing injury risk was 8 (out of 10) in both groups. There was no difference between the groups in source of knowledge or practices around the prevention of injury.
home injuries, with the media noted as the most frequent information source (33%). Participants were asked how much each study item (coupons, pamphlets, phone interviews, or home visits) changed their knowledge, beliefs, or practices with respect to the prevention of these injuries (see https://www.injuryprevention.com/supplemental for table 4). A higher proportion of participants in the intervention group (63%) reported that the home visit changed their knowledge, beliefs, or practices around the prevention of home injuries compared with those in the non-intervention group (43%; p<0.001). The intervention group noted a significant benefit for both the home visit and the specific home injury pamphlet; however, 80% of intervention participants felt that the coupons were of little or no assistance.

**Intervention effect on injury rate**

Over the 36 month follow up period the rate of reported injury visits to the doctor was 0.20 per patient year (95% CI 0.18 to 0.23) for the intervention group and 0.27 per patient year (95% CI 0.24 to 0.30) for the control group. This rate was significantly less for the intervention group (rate ratio = 0.74; 95% CI 0.63 to 0.87) consistent with results found at the 12 month follow up (table 5). However, during the 12–36 month study interval the effectiveness of the intervention appears to have waned (rate ratio = 0.80; 95% CI 0.64 to 1.00).

**DISCUSSION**

This study, of the long term effectiveness of a home safety visit to decrease the rate of home injuries, found a modest but sustained reduction in injury rate up to 36 months following the intervention. The results are consistent with the original 12 month follow up; however, the effectiveness of the intervention appears to be diminishing with time. Participants in the intervention group were more likely to report that the home visit changed their knowledge, beliefs, or practices around the prevention of home injuries. Factors noted by caregivers as significant in the success of the program were the home visit itself and the injury specific safety pamphlets. Coupons, provided to enhance the purchase of safety devices, were not perceived as effective and therefore may not have promoted the adoption of the recommended safety devices.

The findings of this study must be interpreted in light of its limitations. We performed a structured interview with families that had previously participated in a large randomized controlled trial of a home safety visit. Although the individual who performed the structured interview was blinded to the participant intervention status, participants had been made aware of their intervention status at the completion of the original trial. Injuries were self reported and therefore subject to recall bias with the potential of differential recall between the intervention and control groups for the number of injury visits to the doctor or for the intervention parents to underreport injuries. Another limitation was our inability to contact 34% of participants three years after the original study, despite repeated attempts. Finally, although this study only used a single home visit, all participants had telephone reminders at four and eight months following the initial visit, and a second home visit that occurred at 12 months. Though the participants did not report a difference, it is possible that these encounters reinforced the original injury prevention messages.

Injuries in the home are a leading cause of death and a significant cause of morbidity in children. Home injuries may be easily avoided by implementing specific safety measures such as installing cupboard locks, stair gates, and smoke alarms. To assist in the implementation of these safety measures, home visiting programs have been developed and evaluated. These programs usually involve a professional or non-professional visitor providing caregivers with support and education on various topics. Generally, for children who are at risk of an injury, there is evidence from a systematic review to suggest such programs can decrease the incidence of injury. However, given the variety of home visiting programs and the range of settings and individuals to which

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**Table 2** Impact on knowledge and practices: injury prevention and control

<table>
<thead>
<tr>
<th></th>
<th>With intervention</th>
<th>Without intervention</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>How preventable do you think most children’s injuries are?</td>
<td>8 (7.8)</td>
<td>8 (7.8)</td>
<td>0.177</td>
</tr>
<tr>
<td>How much control do you think you have to decrease the risk of your child having an accident?</td>
<td>8 (7.9)</td>
<td>8 (7.9)</td>
<td>0.917</td>
</tr>
</tbody>
</table>

Values are median (first and third quartiles). Scale range from 1–10 with higher value corresponding to better awareness.

**Table 3** Impact on knowledge and practices: which of the following had the greatest impact on your knowledge and practices around the prevention of home injuries? Please choose one only of the following:

<table>
<thead>
<tr>
<th></th>
<th>With intervention (n = 400)</th>
<th>Without intervention (n = 370)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation in this study</td>
<td>91 (23%)</td>
<td>74 (20%)</td>
</tr>
<tr>
<td>Media sources</td>
<td>136 (34%)</td>
<td>116 (31%)</td>
</tr>
<tr>
<td>Advice from family or friends</td>
<td>61 (15%)</td>
<td>65 (18%)</td>
</tr>
<tr>
<td>Your family doctor</td>
<td>12 (3%)</td>
<td>13 (4%)</td>
</tr>
<tr>
<td>Other</td>
<td>100 (25%)</td>
<td>102 (28%)</td>
</tr>
</tbody>
</table>

χ² test, intervention v non-intervention: χ²=2.36 on 4 df, p = 0.67.

**Table 5** Intervention effectiveness: injury rate

<table>
<thead>
<tr>
<th></th>
<th>At 4 months (telephone survey)</th>
<th>At 8 months (telephone survey)</th>
<th>At 12 months (home visit)</th>
<th>At 36 months (telephone survey)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With intervention</td>
<td>Without intervention</td>
<td>With intervention</td>
<td>Without intervention</td>
</tr>
<tr>
<td>Number of injuries since last follow up that resulted in a child seeing a doctor</td>
<td>38 n = 535</td>
<td>63 n = 505</td>
<td>47 n = 510</td>
<td>65 n = 498</td>
</tr>
<tr>
<td>0–12 month rate ratio* (95% CI)</td>
<td>0.69 (0.54–0.88)</td>
<td>0.74 (0.63–0.87)</td>
<td>0.69 (0.54–0.88)</td>
<td>0.74 (0.63–0.87)</td>
</tr>
<tr>
<td>12–36 month rate ratio* (95% CI)</td>
<td>0.80 (0.64–1.00)</td>
<td>0.80 (0.64–1.00)</td>
<td>0.80 (0.64–1.00)</td>
<td>0.80 (0.64–1.00)</td>
</tr>
</tbody>
</table>

*Ratio of rate of injury per person year.
†The 12 month rate ratio in the original publication was 0.75 (95% CI 0.58 to 0.96). The discrepancy arises from the method we used to calculate injury visits in this study. In the original analysis, at each four month interval we counted whether or not a family had an injury visit to the doctor and calculated the rate ratio based on this number and not on the total number of injury visits. Due to the 24 month time interval for follow up in the current study, we used the total number of injury visits to calculate all rate ratios.

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they can be delivered, it has been difficult to determine which components of a program work and for whom.

Factors that contribute to a successful home visit program are often complex. A review of studies examining the effect of home visitation concludes that among the key ingredients of successful programs is the establishment of a strong therapeutic relationship, developed over frequent visits to address underlying factors associated with maternal and child health outcomes.22–27 Our original trial explored whether a single home visit would improve the extent to which families adopt home safety measures for identified safety deficiencies. We noted a decrease in the injury rate for the intervention group but no difference in the adoption of recommended home safety measures.28 The observed failure to adopt these measures may have been related to characteristics of the intervention that required action on the part of the caregiver. For instance, suggestions made for more passive measures (such as lower hot water temperature or installing a smoke detector) were followed, consistent with the knowledge that passive injury prevention strategies are more effective than active strategies (those that require continued parental vigilance and responsibility).28–29 In their study, Geller et al also noted that home safety visits did not increase safety measure adoption, however they did not examine the impact of the program on injury occurrence.39

In conclusion, a home visit aimed at improving home safety and reducing injury was able to demonstrate a sustained, but modest, reduction in injury rate. The lack of adoption of home safety measures by the intervention group in the original trial may have been associated with the perceived lack of usefulness of discount coupons for the purchase of required home safety devices. This study reinforces the benefits of home visit safety programs and the need of the program to focus on a passive intervention and a simple, well defined message. Consideration should be given for future programs to integrate with other home visitation programs and target a few, well focused, evidence based areas including further evaluation to assess the effect of repeated visits on outcome.

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The authors wish to thank Barbara Willard for her coordination and management of the study, and Rick Jane for his assistance in the statistical analysis.

Key points
- A home safety visit was effective to decrease the rate of home injuries.
- The reduction in injury rate was modest.
- The reduction in injury rate was sustained up to 36 months following the intervention.
- The home safety visit changed participant knowledge, beliefs, or practices around the prevention of home injuries.
- The home safety visit and the injury specific safety pamphlets were each perceived as effective in the success of the program.
- Coupons, provided to enhance the purchase of safety devices, were not perceived as effective.

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REFERENCES