Neonatal vitamin K prophylaxis in Great Britain and Ireland: the impact of perceived risk and product licensing on effectiveness

Alison Busfield, Andrew McNinch, John Tripp

Arch Dis Child 2007;**92**:754–758. doi: 10.1136/adc.2006.105304

See end of article for authors' affiliations

Correspondence to:
Alison Busfield, Neonatal Unit, Wonford Hospital, Royal Devon & Exeter NHS Foundation Trust, Barrack Road, Exeter EX2 5DW, UK

Accepted 9 May 2007
Published Online First
30 May 2007

Objective: To determine current use of vitamin K (VK) prophylaxis in newborns and review the efficacy and effectiveness of regimens used.

Design: Efficacy and effectiveness calculated using current practice details, data from Southern Ireland and two previous surveys, together with contemporaneous studies of vitamin K deficiency bleeding (VKDB).

Setting: Current survey: United Kingdom (Great Britain and Northern Ireland). Efficacy and effectiveness tables: United Kingdom and Southern Ireland.

Main outcome measures: Current VK prophylaxis following uncomplicated term deliveries. Relative risk of VKDB calculated for the VK actually received and for "intention to treat".

Results: Questionnaire response rate 95% (n=243), all recommending VK prophylaxis. No association between unit size and route of administration. For uncomplicated term deliveries, 60% recommended intramuscular (IM) prophylaxis, 24% oral and 16% offered both routes without bias. All units offering IM gave a single dose, mostly 1 mg Konakion Neonatal. Oral regimens showed more variation: two thirds gave 2 mg (range 0.5–2 mg), the number of doses ranged from 1 to 11 and many used preparations off-licence or the unlicensed Orakay. IM prophylaxis, if given, provided the best protection (most efficacious) against VKDB. However, on an intention-to-treat basis (effectiveness), there is no statistically significant difference between the risks of VKDB after intended IM VK and after oral prophylaxis intended to continue beyond a week.

Conclusions: Although the principles of VK prophylaxis is now accepted by all, there is no uniformity in practice. Omission of prophylaxis appears to be a greater problem for IM than for multi-dose oral prophylaxis, affecting overall effectiveness.

Although a single 1 mg intramuscular (IM) dose of the Cremophor EL preparation (Konakion Neonatal; Roche, Basel, Switzerland) of vitamin K (VK) provides almost certain protection against vitamin K deficiency bleeding (VKDB),¹ the possibility of an increased risk of childhood leukaemia,² perhaps up to 10%, has not been (and probably cannot be) excluded.^{3–6} In the early 1990s this led to a decline in the use of IM prophylaxis⁷ and to the British Paediatric Association recommending routine use of oral VK in healthy infants, reserving IM for those at highest risk of VKDB.⁸ In 1998 the Department of Health reaffirmed the effectiveness of IM prophylaxis but noted that a small increase in leukaemia could not be completely excluded. While supporting the use of routine prophylaxis, the Department of Health stated no preference for either route, concluding it was a matter for professionals and services locally to agree.⁶ We set out to document practices of VK prophylaxis and their effectiveness in preventing VKDB in Great Britain, Northern Ireland and Ireland.

METHODS

Survey method to determine current practice

A total of 243 consultant-led maternity units in Great Britain and Northern Ireland were identified and surveyed. An authoritative list of these units being unavailable, one was compiled from a meticulous search of the *Medical directory*, two internet directories of maternity services, individual hospital websites and direct hospital contact. In March 2003, a postal questionnaire was sent to the senior midwife of each unit requesting details of VK prophylaxis policies and birth rates both in the unit and in any associated midwife/GP unit. A copy

of each unit's written policy was requested and cross-checked with responses; any ambiguities or inconsistencies were then clarified. Further questionnaires were sent to non-responding units in July and September and a final written request to the paediatrician in December 2003.

Methods for efficacy and effectiveness data

Data were combined from this survey, a similar survey for Ireland⁹ and previous surveys of practice,⁷ each with a contemporaneous study of VKDB.^{10–11} The odds ratios and confidence intervals for the efficacy of oral and IM prophylactic VK actually given, and the effectiveness of prophylaxis on an intention-to-treat basis, were then calculated for all infants in Great Britain, Northern Ireland and Ireland.

RESULTS

Survey results

Of 243 units contacted, 230 (95%) replied and 58 provided their written policy; 38 were re-contacted for clarification. The national statistics offices reported 674 789 births for 2003; an internet directory of maternity services attributed 40 340 births/year to the 13 non-responding units and the cumulative number of reported deliveries was 672 538/year, so there may have been slight over-estimation of births from the reporting units.

Abbreviations: IM, intramuscular; IV, intravenous; VK, vitamin K; VKDB, vitamin K deficiency bleeding

Regimen recommended for uncomplicated term deliveries

The recommended route of prophylactic VK administration is shown in table 1. We found no relationship between unit delivery rate and recommended route of administration. Seeking parental consent was almost universal practice (69% verbal, 30% written).

Intramuscular prophylaxis

Of 174 units offering IM prophylaxis (either recommended or by choice), 159 stated the preparation used and 170 the dose, which was independent of body weight and given once. Where stated, 84% (134) gave Konakion Neonatal (Roche), the vast majority (92%) using 1 mg (0.5 mg in eight units, 0.25 mg in one unit, 0.2 mg in two units), and 15% (24) gave Konakion MM (Roche) 1 mg (2 mg in one unit). Of 136 units recommending IM VK, 91% (123) offered oral VK as an alternative. Of 38 units making no recommendation about route, only 25 reported recommending parenteral administration for high-risk groups.

Oral prophylaxis

Oral prophylaxis was recommended in 56 units (53 of them recommended parenteral administration for high-risk groups) in addition to the 38 offering choice. Of these 94 units, 93 offered oral prophylaxis to every normal risk infant, and one only to those breast-fed. Ninety three units stated the dose used: 2 mg in 61 (66%) units, 1 mg in 23 (24%) and 0.5 mg in nine (10%). Ninety units named the preparation: Konakion MM (Roche) in 51 (56.7%) units, Orakay (an unlicensed product manufactured in Slough, UK in Dr Reddy's laboratories) in 24 (26.7%) and Konakion Neonatal (Roche) licensed for IM use only, in 15 (16.6%).

Of 92 units stating their oral regimen for formula-fed infants, 40 (43%) gave a single dose at birth, 36 (39%) gave two doses (birth and 4–8 days), 15 (16%) gave three doses (birth, 7–10 days, 4–6 weeks) and one gave none. Breast-fed infants were given the same initial dose and preparation as formula-fed infants. One unit gave a single dose at birth, two units gave two doses (birth and 1 week) and 91 (97%) gave three or more doses extending beyond 3 weeks of age, including 16 giving four or more doses over at least 6 weeks.

In 123 units, oral VK was offered if the recommended IM was declined.

Intravenous prophylaxis

A total of 52 units (23% of responders) used prophylactic VK intravenously (IV) for high-risk, mostly preterm infants; almost equal numbers used Konakion Neonatal and Konakion MM. Of the 46 stating the dose, 24 (56%) gave 1 mg, 10 (23%) gave 0.4 mg/kg and the remainder 0.1–0.5 mg (some related to weight). Only six units routinely gave follow-on doses, a decision independent of the initial dose.

Table 1 Recommended route of prophylactic VK administration

	IM	Oral	Choice	None
Percentage of units (n)	59.1 (136)	24.3* (56)	16.5†(38)	0
Percentage of births	60	23.6*	16.4†	0

*One unit recommended prophylactic VK only for breast-fed babies; †these 38 units offered parents the choice of IM or oral prophylaxis without recommendation.

Reasons for changing prophylaxis regimen

The commonest reasons cited for changing VK prophylaxis policy in the 3 years before this study were use of an unlicensed drug (37 units), literature reports about VKDB (35) and parent pressure (10).

Changes in prophylaxis since 1970

Figure 1 summarises results from surveys of VK prophylaxis since 1970, showing a steady fall in the proportion receiving no prophylaxis and the variable use of oral prophylaxis since 1982.

Relative risk of VKDB

Data from previous incidence studies^{10 11} and corresponding surveys of practice^{7 9} are combined in tables 2 and 3 to estimate efficacy and effectiveness of VK prophylaxis in all infants in the study area. Table 2 demonstrates that IM prophylaxis is more efficacious (babies receiving it are at lowest risk of VKDB) than oral prophylaxis given only in the first week and (though not reaching significance) than oral prophylaxis extending beyond a week. In contrast, the effectiveness data, calculated on intention to treat in table 3, show that there is no large or significant difference in effectiveness between IM and the disparate group of oral regimens extending beyond a week; relative risks for the two other groups ("Nil" and "Oral not beyond a week") compared with IM are much lower. The difference between efficacy and effectiveness is the result of omission of VK; in the 1993–94 survey of VKDB, there were several reasons for omission, while in the 2001–02 survey it was solely because parental consent was withheld.

DISCUSSION

VK prophylaxis for all newborns has long been recommended; this study shows that while this has finally been achieved in the UK, uniformity of practice has not. We attribute the reduction in VKDB incidence shown by the British Paediatric Surveillance Unit surveys^{10 11} to this more widespread and effective prophylaxis and to earlier recognition of congenital liver diseases.^{10 11}

What is already known about efficacy, effectiveness and safety?

Current supplementation of formula milks with VK virtually eliminates late onset VKDB (onset after 7 days) and a single dose of oral VK is similarly effective against classical VKDB (onset between 1–7 days).¹⁰ In the breast-fed infant, VK as 1 mg Konakion Neonatal IM or repeated oral dosing (1 mg weekly¹⁴ or 25 µg daily¹) prevents both classical and late VKDB in virtually all babies in large populations even if underlying liver disease is present. Prophylaxis using IV administration is poorly researched and may be less reliable, cases of VKDB occurring even after repeated doses.¹⁵

Despite several studies investigating a possible association of IM VK prophylaxis (Konakion Neonatal 1 mg) with childhood cancer originally described by Golding *et al.*,² it has not been possible to completely refute it.^{4 6} In the UK, a true relative risk of only 1.1 for acute lymphoblastic leukaemia at 12–71 months, whilst difficult or impossible to demonstrate statistically, would cause some 85 additional cases/year (using incidence figures from the Cancer Research UK website and a birth rate of 680 000/year), each needing 2–3 years' treatment and causing perhaps 12 deaths/year (assuming 85% survival). This must be compared with no deaths and no long-term morbidity from VKDB in Great Britain and Ireland in the latest 2-year survey.¹¹

For oral VK it could be suggested that, since Konakion MM 2 mg orally achieves peak blood levels similar to those after Konakion Neonatal 1 mg IM,¹⁶ if there is an increased risk with the latter and if it is related to peak levels, then the licensed three-dose regimen might carry a similar risk (possibly 3 times higher).

Figure 1 Chronology of surveys of VK prophylaxis practice since 1970 and other significant events. (A) Prospective cohort of 16 000 babies – British.⁷ (B) Retrospective national survey – UK (% of units).⁷ (C) Contemporary national survey – UK (% of births – similar results if expressed as % of units).⁷ n = 252 units representing 592 000 live births. (D) Contemporary national survey – British Isles (% of births).⁷ n = 253 units representing 747 000 live births. (E) This report – UK (% births – results unchanged if expressed as % of units). n = 243 units representing 672 538 live births.

Other safety issues for IM prophylaxis include the recurring problem of injecting uterogenics rather than VK¹⁷ and the complications associated with any IM injection (vessel or nerve injury, infection and haemorrhage in infants with bleeding disorders), while for oral prophylaxis there have been three case reports of aspiration pneumonia¹⁸ and a single report of a possible allergic skin reaction.¹⁹

What do we conclude is an effective, safe regimen?

Term babies born by normal delivery should be given VK 1 mg orally at birth to prevent classical VKDB, regardless of the intended feeding. If the dose is vomited it must be repeated; if the baby becomes ill we would recommend IM prophylaxis. Breast-fed infants should have follow-on oral doses of 1 mg weekly¹⁴ or, perhaps with the greatest possibility of safety and efficacy, a daily dose of around 25 µg as adopted in the Netherlands¹ and equivalent to the supplement received from formula milk, until it is clear they do not have covert liver disease or other cause of malabsorption (our preference would be for 3 months). We see no logic in giving follow-on doses to babies feeding well on formula milk. IM prophylaxis is useful to protect babies who are sick, preterm or born to mothers taking drugs which antagonise VK. It must be remembered that VK prophylaxis alone does not ensure invulnerability to VKDB, so surveillance for prolonged jaundice, failure to grow and any bleeding manifestation remains essential. We are aware that this conclusion is at variance with that reached by the National Institute for Health and Clinical Excellence and their 2006 guidelines.

How has practice changed over the past 20 years?

Clearly more infants now receive effective prophylaxis and the incidence of VKDB and associated morbidity/mortality has fallen. Previously parental consent was rarely sought; now it is required in virtually all units. A wide variety of prophylaxis regimens are used with little or no rationale for difference. The decline in use of IM prophylaxis in the 1990s in favour of oral administration is found to be reversed in this survey, perhaps because 20% of paediatricians previously fearing an association with childhood leukaemia have now discounted any link. Other explanations might include paediatricians lacking confidence in the effectiveness of oral prophylaxis, considering it too difficult or costly, or anxious that the lack of a licensed preparation suitable for parents to administer puts them at professional risk.⁶

Multi-dose oral regimens now predominate among units recommending oral prophylaxis, but only 16 (17%) use regimens appearing to maximise efficacy and safety with four or more oral doses for breast-fed infants extending over at least 6 weeks. This reflects the guidance from the Department of Health⁶ which advised only three doses and the lack of an oral product with a license to be used more frequently.

We note that most units using IV prophylaxis, almost always for infants with no oral intake, do not plan follow-up doses.

Dilemmas of clinical practice

Real dilemmas persist for both professionals and parents. For IM prophylaxis there remain justifiable concerns about the trauma of an injection and the possible but unproven fears of

Table 2 Efficacy of prophylaxis: cases of VKDB grouped by VK actually received, from the three surveys of incidence (1988–2002)

Prophylaxis received	Estimated* at-risk population†	Cases of VKDB	Estimated* incidence	Relative risk versus IM‡ (95% CI)
Intramuscular	2535 000	3§	1 in 845 000	1
Oral beyond a week	928 000	4¶	1 in 232 000	3.64 (0.82 to 16.3), p=0.07
Oral not beyond a week	861 000	25¶	1 in 34 000	24.53 (7.4 to 81), p<0.001
Nil	290 000	34	1 in 8 500	99 (29 to 402), p<0.001

*Estimated because firm data were unavailable as some babies are given different prophylaxis from that routinely recommended for normal risk deliveries, either through parental choice or clinician allocation.

†Population includes all infants (all gestations, birth weights, risk categories, etc).

‡Calculation of RR shows little variation between the three studies.

§One received only 100 µg VK.

¶In the 2001–02 study, two infants bled after receiving oral VK; one probably had multiple doses beyond day 7, the other two doses in the first week.

Table 3 Effectiveness of prophylaxis: cases of VKDB grouped by treatment intended, from the second and third surveys*

Prophylaxis intended	Estimated§ at-risk population‡	Cases of VKDB	Estimated§ incidence	Relative risk versus IM (95% CI)
Intramuscular	1575 000†	11	1 in 143 000	1
Oral beyond a week	928 000†	11	1 in 84 400	1.70 (0.74 to 3.91), p=NS
Oral not beyond a week	371 000	10	1 in 37 100	3.86 (1.64 to 9.09), p<0.02
Nil	32 000	2	1 in 16 000	8.95 (1.98 to 43.4), p<0.01
Overall	3 066 000	34	1 in 90 200	

*Surveys of incidence 1993–94 and 2001–02; five cases excluded as details of intended prophylaxis were not available. The first incidence survey, 1998–90, did not include the question “What was unit policy for this infant?”.

†Populations offered a choice between IM and oral are allocated equally between groups.

‡Population includes all infants (all gestations, birth weights, risk categories, etc).

§Estimated because firm data were unavailable as some babies were given different prophylaxis from that routinely recommended for normal risk deliveries, either through parental choice or clinician allocation.

What is already known on this topic

- Late onset VKDB can be virtually eliminated by 1 mg of Konakion Neonatal IM, feeding with standard (VK-supplemented) infant formula and ongoing supplementation of breast-fed infants with oral VK.
- A described association between childhood leukaemia and IM prophylaxis cannot be disproven.
- There is no oral VK preparation licensed in the UK suitable for parents to administer.

What this study adds

- VK prophylaxis in the UK remains chaotic; IM prophylaxis is being increasingly used while many units administer unlicensed or off-license oral VK and not in the most efficacious dosing regimens.
- Compared to a pooled group of oral regimens extending beyond 7 days, IM prophylaxis is probably more efficacious if actually administered but is not shown to be more effective on an intention-to-treat basis.

an increased leukaemia risk.^{20–21} For oral prophylaxis there is anxiety about efficacy, reliability of follow-up dosing²⁰ and lack of an appropriate preparation.²¹ Konakion Neonatal and Orakay were used for oral prophylaxis by 17% of units although unlicensed for oral use; Konakion MM is licensed but requires use of syringes and glass vials and is costly (especially if professionally administered).

Health providers have, by seeking parental consent, delegated some responsibility for decisions about prophylaxis; most offer a recommendation and an alternative, but some offer no clear guidance.

What are the messages from the widely different efficacy and effectiveness data?

At the time of this study we seem to have had the unhappy situation where the lack of an agreed, national policy, together with appropriate professional and parental concern to “Do no harm”, increased the risk of effective prophylaxis being omitted.¹¹ Although there is proper concern that oral prophylaxis doses may be omitted at home,²⁰ failure of oral multiple dose regimens is rare. Conversely, treatment omission, through error or withholding of parental consent, appears to be more common in units recommending IM prophylaxis¹¹ and this largely negates its efficacy advantage.

Both problems have been successfully resolved in two European countries where oral prophylaxis, completed by parents, is used for all normal-risk deliveries.^{1–14} In contrast, the American Academy of Pediatrics has issued a policy statement discounting any association with cancer and confirming that VK should be given as a single IM dose of 1 mg (preparation not specified).²² A group of Australian authorities, in a statement similar to that of the UK Department of Health, has left the decision to local paediatricians.²³

CONCLUSION

Most units currently seek parental consent for prophylaxis but expose newborns to possible health risks by recommending the IM route as routine, by over-treating formula-fed infants or

under-treating breast-fed infants. These data reinforce a previous recommendation that urgent priority be given to developing, licensing and promoting a low-dose oral VK preparation suitable for daily administration by parents,^{24–26} following the lead of some other European countries.^{1–14} IM prophylaxis remains essential for some babies, but lack of certainty about safety, and of published efficacy data for Konakion MM (now the only licensed option) given intramuscularly, cause us concern.

ACKNOWLEDGEMENTS

We thank the UK Department of Health for funding the studies, the BPSU for making them possible, and all reporting paediatricians and midwives for their collaboration. We also thank the reviewers of this paper, Drs Martin Shearer and Paul Clarke, for very constructive criticism.

Authors' affiliations

Alison Busfield, Andrew McNinch, Royal Devon and Exeter NHSF Trust, Barrack Road, Exeter, UK

John Tripp, Peninsula Medical School, Exeter, UK

Competing interests: JHT and AWM have received funding from Roche Pharmaceuticals. JHT acted as an expert witness to the MHCA in an appeal for approval of an oral preparation of vitamin K1 by another company. Neither Roche nor the funders of this study have influenced the research or publication in any way.

Ethical approval was obtained from the North and East Devon Research Ethics Committee.

REFERENCES

- 1 **Cornelissen M**, von Kries R, Loughnan P, *et al*. Prevention of vitamin K deficiency bleeding: efficacy of different multiple oral dose schedules of vitamin K. *Eur J Pediatr* 1997;**156**(2):126–30.
- 2 **Golding J**, Greenwood R, Birmingham K, *et al*. Childhood cancer, intramuscular vitamin K and pethidine given during labour. *BMJ* 1992;**305**:314–16.
- 3 **Roman E**, Fear NT, Ansell P, *et al*. United Kingdom Childhood Cancer Study. Vitamin K and childhood cancer: a report from the United Kingdom Childhood Cancer Study. *Br J Cancer* 2003;**89**(7):1228–31.
- 4 **Passmore SJ**, Draper G, Brownbill P, *et al*. Case-control studies of relation between childhood cancer and neonatal vitamin K administration. *BMJ* 1998;**316**:178–84.

- 5 Roman E, Fear NT, Ansell P, *et al*. Vitamin K and childhood cancer: analysis of individual patient data from six case-control studies. *Br J Cancer* 2002;**86**(1):63–9.
- 6 Department of Health. *Vitamin K for newborn babies*, PL/CMO(98)3. London: HMSO, 1998.
- 7 Barton JS, Tripp JH, McNinch AW. Neonatal vitamin K prophylaxis in the British Isles: current practice and trends. *BMJ* 1995;**310**:632–3.
- 8 Expert Committee. *Vitamin K prophylaxis in infancy*. London: British Paediatric Association, 1992.
- 9 Philip RK, Gul R, Dunworth M, *et al*. Ireland lacks consensus on neonatal vitamin K prophylaxis. *BMJ* 2001;**323**:1068.
- 10 McNinch AW, Tripp JH. Haemorrhagic disease of the newborn in the British Isles: two year prospective study. *BMJ* 1991;**303**:1105–9.
- 11 McNinch A, Busfield A, Tripp J. Vitamin K deficiency bleeding in infants in Great Britain and Ireland: British Paediatric Unit Surveys, 1993–4 and 2001–2. *Arch Dis Child* 2007;**92**:759–66.
- 12 McNinch AW, Orme RL, Tripp JH. Haemorrhagic disease of the newborn returns. *Lancet* 1983;**1**(8333):1089–90.
- 13 McNinch AW, Upton C, Samuels M, *et al*. Plasma concentrations after oral or intramuscular vitamin K1 in neonates. *Arch Dis Child* 1985;**60**(9):814–18.
- 14 Hansen KN, Minousis M, Ebbesen F. Weekly oral vitamin K prophylaxis in Denmark. *Acta Paediatr* 2003;**92**(7):802–5.
- 15 Loughnan PM, McDougall PN, Balvin H, *et al*. Late onset haemorrhagic disease in premature infants who received intravenous vitamin K1. *J Paediatr Child Health* 1996;**32**(3):268–9.
- 16 Greer FP, Marshall SP, Severson RR, *et al*. A new mixed micellar preparation for oral vitamin K prophylaxis: randomised controlled comparison with an intramuscular formulation in breast fed infants. *Arch Dis Child* 1998;**79**:300–5.
- 17 Bangh SA, Hughes KA, Roberts DJ, *et al*. Neonatal ergot poisoning: a persistent iatrogenic illness. *Am J Perinatol* 2005;**22**(5):239–43.
- 18 Bhandari V, Tin NO, Ahmed SR. Aspiration pneumonia in association with oral vitamin K [letter]. *Arch Dis Child Fetal Neonatal Ed* 2002;**87**(3):F232.
- 19 Ford GJ. Possible skin allergy reaction to oral vitamin K [letter]. *J Paediatr Child Health* 1993;**29**(3):241.
- 20 Croucher C, Azzopardi D. Compliance with recommendations for giving vitamin K to newborn infants. *BMJ* 1994;**308**:894–5.
- 21 Ansell P, Roman E, Fear NT, *et al*. Vitamin K policies and midwifery practice: questionnaire survey. *BMJ* 2001;**322**:1148–52.
- 22 American Academy of Pediatrics Committee on Fetus and Newborn. Controversies concerning vitamin K and the newborn. *Pediatrics* 2003;**112**:191–2.
- 23 National Health and Medical Research Council. Joint statement and recommendations on vitamin K administration to newborn infants to prevent vitamin K deficiency bleeding. Available at http://www.nets.org.au/PDF/Vitamin_K_2001.PDF (accessed 11 June 2007).
- 24 Tripp JH, McNinch AW. The vitamin K debacle: cut the Gordian knot but first do no harm. *Arch Dis Child* 1998;**79**(4):295–7.
- 25 von Kries R. Oral versus intramuscular phytonadione: safety and efficacy compared. *Drug Saf* 1999;**21**:1–6.
- 26 Hey E. Prevention of vitamin K deficiency in newborns. *Br J Haematol* 1999;**106**:255–6.

IMAGES IN PAEDIATRICS.....

doi: 10.1136/adc.2007.123844

Ironing board impalement

A 12-year-old boy was admitted with a metal foreign body embedded in his right buttock. While carrying an ironing board down the stairs he tripped and impaled himself on the ratchet mechanism (fig 1). The fire brigade helped free the boy from the board. x Rays revealed the foreign body was close to the hip joint (fig 2). Surgical removal was uneventful and the patient was discharged the following day after receiving tetanus immunoglobulin and vaccination. No other ironing board related injuries are reported in the literature. However, there are anecdotal reports of ironing boards being used to surf down

Figure 1 Ratchet mechanism.

Figure 2 x Ray showing ratchet mechanism close to the hip joint.

flights of stairs. Care should be taken when carrying objects on the stairs, and domestic appliances should only be used as intended.

Fiona Napier, Simon Fountain-Polley, Chetana Kallapa
Birmingham Heartlands Hospital, Birmingham, UK

Correspondence to: Simon Fountain-Polley, Birmingham Heartlands Hospital, Bordesley Green East, Birmingham B9 5SS, UK; pollgysim@yahoo.com

Competing interests: None.