Infection control is a key part of the nurse’s role and handwashing is one of the most effective ways to prevent germ transfer: when done well, it can prevent up to a third of infections (Randle et al, 2013). The crucial role of handwashing has been further highlighted during the current coronavirus pandemic, as shown in guidance from the Centers for Disease Control and Prevention (CDC) in the US, which outlines the importance of effective handwashing in preventing the spread of Covid-19 (Bit.ly/CDCHandwashingCovid).

As well as reducing transmission of community-acquired infections, handwashing is the best line of defence against hospital-acquired infections (HAIs) (Watson, 2019) and it is important that correct handwashing practices are adhered to, both inside and outside of healthcare settings, to reduce the spread of communicable diseases. This article describes a set of children’s educational resources called A Germ’s Journey, designed to improve children’s handwashing behaviour. It looks at the evidence from several studies on how these resources can improve children’s handwashing practice along with their understanding of microorganism transmission, and the implications for the nurse’s role in infection prevention in both the community and healthcare facilities.

Handwashing in children
Although there are many interventions aimed at improving health professionals’ handwashing practices, there are few resources aimed at patients (Watson, 2019); however, patients’ hand hygiene is equally as important at reducing the spread of infections in a hospital-based setting (Haverstick et al, 2017). The hand-hygiene behaviours of young children, both in general in the community and as patients in hospital, are especially important to target as children are particularly vulnerable to the contracting and spreading of communicable diseases. This is partly due to their

Key points
- Handwashing is vital for infection control, but there are few evidence-based interventions aimed at children
- A set of resources to teach children how and why they need to wash their hands has been effective in school and community settings in three continents
- The resources have been adapted for hospital use, taking account of limited facilities and the time constraints nurses face
- Nurses could use the resources to teach children about hand hygiene in hospital and community settings as part of infection control
- Further resources have been developed to teach children hand hygiene in relation to respiratory diseases to combat the spread of SARS-CoV-2

Evaluating a children’s learning resource to improve handwashing behaviour

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Abstract
Effective handwashing can reduce up to a third of infections and is an important line of defence against community and hospital-acquired infection, including Covid-19. Young children are particularly vulnerable to spreading and contracting infectious disease, and often lack the knowledge and motivation to engage in effective handwashing strategies. Despite this, there are few evidence-based handwashing interventions aimed at children. This article summarises research on the effectiveness of a set of learning resources for children designed to improve handwashing behaviour, which have been tested in school and community settings; it also discusses how nurses could use these resources in hospital and community settings to help with infection control.

Citation
imature immune systems, but also their tendency to engage in behaviours such as exploring objects with their hands and mouths (Alexandrino et al, 2016).

Infections are a great cause of morbidity and mortality in children worldwide; diarrhoeal diseases account for more than one in nine child deaths, resulting in a daily death toll that is greater than that for advanced HIV, malaria and measles combined (CDC, 2015). This highlights the importance of targeting the handwashing practices of young children in schools to prevent the transmission of infections.

Teaching hand hygiene to young children in education settings will not only reduce transmission of communicable diseases and the likelihood of hospital admissions, but also the risk of HAIs in children admitted to hospital. Despite this, there are very few empirically tested and theoretically driven handwashing resources aimed at young children (Crosby et al, 2019a; Crosby et al, 2019b).

“Handwashing, when done well, can prevent up to a third of infections”

Developing an educational resource

An interdisciplinary (microbiology, education, psychology) team of researchers from De Montfort University identified the need for evidence-based handwashing resources aimed at young children. They observed specific challenges associated with improving young children’s handwashing practices, including:

- Fundamental lack of understanding in young children of germ transfer and the link between germs and illness, as germs are invisible to the naked eye;
- Lack of motivation among children to engage in protective behaviours that mitigate against the threat of germs, including thorough handwashing.

To address these issues, the team worked with international partners to develop a set of resources called A Germ’s Journey. The resources include:

- A book by Laird and Younie (2016) with a thermochromic ink feature that changes colour when the temperature changes;
- A guided step-by-step song and video;
- Online interactive games;
- Posters in a variety of languages;

As well as making the resources available on the A Germ’s Journey website (germsjourney.com), the research team developed a glo-gel handwashing activity to deliver as part of an interactive suite of activities. The intervention allows both the children and adult observers (teachers, community workers, etc) to benefit in terms of learning so that, while the children engage in the resources, adults are trained to deliver the intervention in future. The team also developed train-the-trainer workshops so large groups of adults could be trained at once to ensure the sustainability and reach of the resources.

Interventions tend to be more effective at instigating positive behavioural change when they are theoretically based (Taylor et al, 2012), so the development and implementation of these resources was guided by theories of learning and behaviour change (Younie et al, 2020; Crosby et al, 2019a; Crosby et al, 2019b). As an example, the resources focus on experiential learning, highlighting the importance of in-context learning and direct sense experience (Crosby et al, 2019a; Kolb, 1976), and encouraging children to learn through their own hands-on experiences. The resources are also designed to target children’s knowledge, skills, motivation and social desire to engage in effective handwashing, which have all been highlighted as factors linked to behavioural change (Michie et al, 2011).

Implementation

The multicomponent intervention has been delivered in school, museum and community centre workshops across the East Midlands in the UK, the state of Gujarat in India and the city of Makeni in Sierra Leone. By December 2020, a total of 6,450 books had been sold or donated globally and the resources had reached 145,432 individuals either directly or via our website. This included 15,532 children reached through our workshops and training educators.

The interactive resources (including books, web games, posters and handwashing song videos) were co-created with international partners and end users across Africa, Asia and Europe to ensure cultural authenticity. Non-governmental organisations, such as Manav Sadhna and the Environmental Sanitation Institute in India, as well as the University of Makeni in Sierra Leone, the charity Voluntary Service Overseas (VSO) and Thinktank, Birmingham Science Museum were all involved in this work.

Teachers in the UK and Sierra Leone said the resources were useful to them and, in India, all teachers participating in focus groups said the resources allowed them to teach infection control and handwashing more frequently and effectively. Train-the-trainer workshops were delivered to teachers in the UK, India and Sierra Leone to ensure long-term sustainability of the project. Books have been donated for distribution across schools, community centres, hospitals and rural outreach clinics across Europe, Asia and Africa, and plans to implement A Germ’s Journey resources into the school curriculum in Makeni are being discussed.

The resources have also been used in crisis settings. With help from VSO in Bangladesh, they have been integrated into its Early Childhood Care and Education (ECCE) in Emergencies programme developed for use in the Rohingya refugee camp. This has enabled delivery of hand-hygiene education in areas of severe economic disadvantage, where effective hand-hygiene habits can be life-saving.

The culturally diverse nature of these resources is also useful in the UK. For example, Thinktank, Birmingham Science Museum has displayed A Germ’s Journey posters in different languages to represent its visitor demographic. The museum has also made the song video a permanent feature of its bathroom facilities in the Mini-Brum gallery, displayed the posters throughout its museum bathrooms and delivered workshops to visiting schoolchildren using the resources. This has enabled the museum to increase its science content, as well as improving visitors’ engagement and understanding of germ transfer and handwashing techniques.

The resources have recently been adapted in response to the Covid-19 pandemic. An e-book, Bye-bye Germs, was created to teach children about hand-hygiene habits in relation to respiratory diseases. The e-book was provided free of charge for a limited time to help fight the spread of coronavirus. A hard copy followed, along with funding for 1,000 books and interactive materials to be distributed free across the UK. The books are all available to buy on the A Germ’s Journey website (Bit.ly/byebyegerms).

Measuring effectiveness

To provide empirical support for the resources, the research team have conducted several studies to assess their efficacy at improving children’s understanding of germs, handwashing behaviour and subsequent illness prevalence across different settings.
Understanding
A randomised controlled study in four UK schools in 2019/20 with 225 children in early-years foundation classrooms found children’s knowledge of germs increased by 40% (p<0.001) immediately after receiving an A Germ’s Journey intervention (Younie et al, 2020). This improvement in knowledge remained significant at 30% (p<0.001) one month after the intervention was delivered, thereby showing that the workshops had a sustained impact on young children’s knowledge of germ transfer.

This corroborated a 2017 study in six UK schools with 265 children and 24 teachers, which also showed that the resources improved children’s knowledge of germs (Crosby et al, 2019a). Teachers reported an increased understanding of germs in pupils who had completed the workshops, with 80-100% agreeing the resources were successful in improving children’s understanding.

In India, workshops using the Gujarati version of the A Germ’s Journey book with young people aged 9-17 years gave 54% of children an increased understanding of germs, as measured by worksheets before and after the workshops, with participants’ understanding at baseline as measured by worksheets before and after the workshops, with participants’ understanding at baseline and follow-up scores for the control group, the intervention group showed statistically significant improvements between baseline and follow-up for the individual behaviours of contact around wrists, fingers and nails; this suggests the intervention gave sustained improvements in handwashing behaviours.

A second study was done at Thinktank, Birmingham Science Museum to evaluate the efficacy of the song video (displayed in the museum’s public bathrooms) at improving children’s handwashing behaviours (Younie et al, 2020). The same six-item behavioural checklist was used, but with children only observed once, either washing their hands just before the intervention (control group, n=36) or just after the intervention (intervention group, n=36). Participants in the intervention group completed significantly more of the six behaviours than the control group (scoring 3.31 compared with 2.61, p<0.001) (Fig 1). Most notably, the intervention group showed statistically significantly higher engagement in washing in between their fingers, compared with the control group.

The biggest improvements were seen in handwashing immediately after the intervention, with children completing significantly more of the six behaviours compared with at baseline (2.56 compared with 2.20, p<0.001). This improvement was particularly significant for use of soap and the washing of wrists, fingers and nails.

Despite a slight drop in behavioural scores one month after the intervention, the improvement remained significant (2.67, p<0.001). Although there were no significant differences between baseline and follow-up scores for the control group, the intervention group showed statistically significant improvements between baseline and follow-up for the individual behaviours of contact around wrists, fingers and nails; this suggests the intervention gave sustained improvements in handwashing behaviours.

Effect of song activity in improving children’s handwashing behaviours

Illness prevalence
In India, a study (yet to be published) showed that teachers using the resources in classrooms observed a reduction in diarrhoea and vomiting-related illness, both in their schools and in the community; this suggests the impact of the resources on illness had expanded beyond the classroom to children’s families and the wider community, as children went home and passed on their knowledge about germs and handwashing.

The nurse’s role
The effectiveness of the resources in school and community settings suggests A Germ’s Journey could also help nurses prevent infectious disease transmission in community and hospital settings.

School nurses
Schools are hotspots for the transmission of infectious diseases and a key role of the school nurse is infection control in the school environment (Bergren, 2017). Just as teachers are trained to use the resources and workshop intervention, school nurses could be trained to deliver the multi-item behavioural checklist. This assessed whether the children:

- Used soap;
- Rubbed their hands together;
- Made contact with their wrists;
- Washed in between their fingers;
- Washed under their nails;
- Dried their hands.

The biggest improvements were seen in handwashing immediately after the intervention, with children completing significantly more of the six behaviours compared with at baseline (2.13 compared with 2.20, p<0.001). This improvement was particularly significant for use of soap and the washing of wrists, fingers and nails.

Despite a slight drop in behavioural scores one month after the intervention, improvements sustained for up to a month after the intervention.
Clinical Practice

Discussion

Component intervention through train-the-trainer workshops.

Feedback from teachers who received the workshops showed they found the resources helpful, enabling them to teach hand hygiene more effectively. Although school nurses already have advanced knowledge of infection control, A Germ’s Journey resources were designed with theories of learning and behaviour change in mind, increasing their suitability for young children in the early years foundation stage and making behavioural change more likely. This could give school nurses an effective way of teaching infection control, which could, in turn, help reduce the transmission of community-acquired infections and HAIs in children.

Paediatric wards

The Health Protection Agency (2012) estimated that infection rates on paediatric wards cost the NHS £1bn a year in 2011. Although the A Germ’s Journey resources are yet to be used in hospitals, their success across other settings suggests their potential use and benefit for paediatric wards. To account for limited children’s handwashing facilities and constraints on nurses’ time, the resources have been adapted for use in a hospital setting. A Germ’s Journey Soapers Stars features a range of characters to engage children in handwashing (Fig 2) and includes a box of handwashing products (including antibacterial hand wipes and hand gel), as well as educational resources such as a reward system sticker chart and colourful booklet unfolding into a poster with information about germs.

Specialist infection control clinical nurses helped co-create the resources to ensure their usefulness for the nursing team and young patients. The interactive nature of the resources is underpinned by the theory of experiential learning, which benefits the child’s learning and minimises the burden on the nurses’ time. The resources will be used as part of an educational intervention and their effectiveness evaluated in improving children’s engagement with handwashing and reducing infection rates on paediatric wards. This is due to start in December.

Conclusion

A Germ’s Journey resources offer an evidence-based, empirically validated behaviour change intervention to teach young children about germ transfer and effective handwashing techniques. To date, few interventions target patients’ handwashing behaviours, especially those of young children. The success of the resources across three continents in different settings shows their potential for use by nurses to educate young children about infection control in both community and healthcare settings. Their adaptation for use in hospital settings offers a time-effective way to increase paediatric patients’ understanding of germ transfer and handwashing techniques. This could reduce the transmission of community-acquired infections and HAIs, as well as Covid-19.

References


