

Title: Pilot study of awareness and skill sets before and after child passenger safety training in Singapore

Primary Researcher: Ronald Ming Ren Tan (KK Women's and Children's Hospital, Singapore)

Co-researchers: Arif Tyebally, Jasmine Xun Yi Feng, Shelly-Anne Sherwood, Nirmal Kavalloor Visruthan, Shu-Ling Chong (KK Women's and Children's Hospital, Singapore)

Summary

Introduction: In Singapore, non-compliance to child car seats is high and begins from infancy. Parents cite lack of knowledge and installation skills as barriers to child car seat use, with the hospital being a crucial touch point for education.

Methods: This study was a pre- and post-intervention online survey of healthcare professionals (nurses and doctors) in a tertiary children's hospital assessing their awareness and skill sets before and after receiving online child passenger safety training.

Results: There were 755 respondents for the pre-course survey and 591 respondents for the post-course survey. For competency-based questions, the average self-assessed familiarity score for all ten competency dimensions increased from pre- to post-course, with an average percentage increase in score of 71%. For "true/false" knowledge-based questions, the percentage scoring correct answers increased from pre- to post-course in 17 of 20 questions.

Conclusions: Child passenger safety training increases knowledge in the immediate and short-to-medium term post-training period in healthcare professionals.

Aim of Research

Road traffic injuries are a significant, yet preventable, worldwide cause of childhood morbidity and mortality.¹⁻² Child passenger safety is achievable with the use of appropriate child car seats (CCS) shown to lower the risk of injury by up to 82% and risk of death by 28%.³⁻⁵ Clear guidelines have been established for appropriate CCSs for children of different ages travelling in motor vehicles.⁶ In Singapore, although the Road Traffic Act states that CCS use is mandatory,⁷ a large number of children presenting to paediatric emergency departments are unrestrained at the time of the road traffic accident.⁸⁻⁹

In a retrospective cohort of over 2,000 Singaporean children with road traffic injuries, more than half were unrestrained.⁸ Even more concerning, non-compliance to CCSs begins from infancy.⁸ In a subsequent qualitative study conducted with parents of young children,¹⁰ parents listed lack of knowledge on importance and effectiveness of CCSs, and inadequate installation skills as barriers to CCS use. Parental suggestions to improve CCS compliance **from birth** included the **hospital as a "crucial touch point"** for opportunistic education and assistance with installation.¹⁰ This apparent gap in parental knowledge and skills may be addressed by providing information and guidance during postnatal discharge of newborn infants from hospital, as well as during visits to the hospital Emergency Department. There is then a need to "train the trainers", educating healthcare professionals to teach parents the requisite knowledge and skills for safe use of child car restraints.

In the current pilot study, we examine the awareness and skill sets of healthcare staff before and after receiving online child passenger safety training. This will enable us to establish sustainable training programs for healthcare staff to provide effective patient and family education on CCSs, with the long-term aim of shifting upstream: from managing road traffic injuries in children, to preventing significant road traffic injuries through correct use of CCSs for all children in passenger cars.

Method of Research and Progression

Institutional setting and study population:

KK Women's and Children's Hospital (KKH) is an 830-bed tertiary hospital in Singapore, in which approximately 12,000 well babies are born each year, and an annual emergency department volume of approximately 150,000 patients prior to the COVID-19 outbreak. From 21-25 June 2021, we conducted Child Passenger Safety training for healthcare staff including nurses and doctors from the Emergency Department, Neonatology, and Obstetrics, who may give child passenger safety advice to families in the course of their daily work. This consisted of 2-hour long online sessions held on a videoconferencing platform (Zoom Video Communications, San Jose, USA) with a cumulative attendance of 727 persons over three sessions (each having identical course content). The didactic component was taught by a United States-certified Child Passenger Safety instructor and the interactive component facilitated by paediatric emergency physicians and a hospital physiotherapist. The course content included the following aspects of child passenger safety relevant to patient and family education: a) how a car seat protects a child, b) how to choose a car seat for various aged children, c) how to answer parents' frequently asked questions and where to find resources, d) modelling and advocating for best-practice child passenger safety in one's family and community, and e) identifying obvious car seat mistakes.

Study design:

The survey was a pre- and post-intervention self-administered anonymous questionnaire distributed to participants as an online form (Google LLC, Mountain View, USA), prior to attending the training ("pre-course"), and at the end of each training session ("post-course"). The survey included competency-based questions with self-reported familiarity scores, and "true/false" knowledge-based questions. Participants were encouraged to complete the survey immediately following training, and allowed up to two months (until 25 August 2021) following the training to complete the post-course survey, with periodic reminders approximately every 1-2 weeks. Data were analysed with descriptive statistics. The institutional review board granted an exemption from ethics review (reference number 2020/2473).

Results of Research

The demographic characteristics of survey respondents are shown in Table 1. Of 807 staff administered the pre-course survey, 755 answered (response rate 93.6%). Of 727 course participants, 591 answered the post-course survey (response rate 81.3%). The profiles of pre- and post-course survey participants were similar in their areas of work, professional role, age and gender. Of note, less than 5% of respondents had previously attended any teaching on child car restraints.

Table 1. Demographic characteristics of survey respondents

Characteristic	Pre-course, n (%)	Post-course, n (%)
Total number of survey participants	755	591
Area of work	Children's Emergency: 172 (22.8%) Neonatal Intensive Care Unit, Nursery, and Delivery Suite: 551 (72.9%) Paediatric Ward: 32 (4.2%)	Children's Emergency: 103 (17.4%) Neonatal Intensive Care Unit, Nursery, and Delivery Suite: 467 (79.0%) Paediatric Ward: 21 (3.6%)
Professional role	Nurse: 675 (89.4%) Doctor: 71 (9.4%) Allied Health: 9 (1.2%)	Nurse: 539 (91.2%) Doctor: 45 (7.6%) Allied Health: 7 (1.2%)
Mean Age in years	37.1 years (range 18-74)	37.5 years (range 19-74)
Gender	Female: 722 (95.6%) Male: 33 (4.4%)	Female: 569 (96.3%) Male: 22 (3.7%)
Attended relevant course including teaching on child car restraints	Yes: 24 (3.2%)	Yes: 11 (1.9%)

The first part of the survey consisted of ten competency-based questions related to child passenger safety, in which respondents were asked to rate their familiarity on a five-point scale, 1 being "not familiar", and 5 being "very familiar". The tenth and final question rates their overall familiarity with child car seats. Table 2 shows that the average self-assessed familiarity score for all ten competency dimensions increased from pre- to post-course, with an average percentage increase in score of 71%. The greatest gains were learning when to transition the child to the next stage of child car seat, and how to select an age-appropriate child car seat.

Table 2. Average familiarity score for each competency dimension (1 = "not familiar", 5 = "very familiar")

Competency dimension	Pre-course	Post-course	% Increase
1. Where to find reliable information on child car seats	2.36	4.06	72%
2. How to select an age-appropriate child car seat	2.24	4.13	89%
3. When to transition the child to the next stage of child car seat	2.16	4.11	90%
4. Where to obtain a child car seat	2.75	4.21	53%
5. How to install the child car seat in the car	2.15	3.88	80%
6. How to buckle a child in the car seat	2.64	4.09	55%
7. Whether the car seat should face forwards or backwards	2.75	4.23	54%
8. How to find a taxi/private hire vehicle with child car seats	2.47	3.98	61%
9. How to encourage a crying infant to stay in the car seat	2.24	4.11	83%
10. Your overall familiarity with child car seats	2.27	4.07	79%

The second part of the survey comprised twenty "true/false statement" knowledge-based questions testing key aspects of the course content. Table 3 shows that in 17 of 20 questions, the percentage scoring correct answers increased from pre- to post-course (percentage increase ranging from 0.2% - 21.6%). For the remaining 3 questions where the percentage of correct answers in the post-course survey decreased, the difference ranged from 0.2 - 2.6%.

Table 3. Percentage scoring correct answer on "true/false statement" knowledge questions

Knowledge question (Correct answer in parentheses)	Pre-course	Post-course	% Change
1. Singapore has a legal requirement to use a child car seat in cars and private hire vehicles. (True)	95.8%	94.1%	-1.7%
2. Child car seats are effective in protecting children in the event of an accident. (True)	99.6%	99.8%	+0.2%
3. Since I grew up without a child car seat, my child need not have one. (False)	90.6%	91.5%	+0.9%
4. Even if I drive safely, other drivers may not. (True)	94.7%	95.4%	+0.7%
5. Even a short trip carries the risk of a serious road traffic accident. (True)	99.2%	99.0%	-0.2%
6. Second-hand child car seats are only safe before the expiry date and if accident-free. (True)	49.3%	69.4%	+20.1%

7. Babywear/baby carrier is NOT a substitute for a child car seat. (True)	93.2%	95.4%	+2.2%
8. Child car seats when used appropriately are safe for an infant's breathing and infant's spine. (True)	94.7%	97.6%	+2.9%
9. If practical, it is better not to use the car seat as a seat for the child when they're not in the car. (True)	65.3%	79.0%	+13.7%
10. Premature babies should not be placed in a child car seat. (False)	64.2%	81.2%	+17.0%
11. An infant's harness should be snug, at shoulder level or just below the shoulder, in a rear-facing car seat. (True)	82.3%	92.0%	+9.7%
12. It is all right to place a swaddled baby in a car seat and/or place bolsters/pillows around them. (False)	72.7%	77.3%	+4.6%
13. It is all right for a newborn infant to look small compared to the car seat. (True)	55.6%	74.8%	+19.2%
14. If the infant appears fragile, this is the reason why the child car seat should be used. (True)	56.6%	78.2%	+21.6%
15. Children should ride in rear-facing car seats until age 2 or older. If their seat's height/weight limit allow, they should remain rear-facing until age 4 or older. (True)	75.5%	92.0%	+16.5%
16. You can place a rear-facing car seat in the front of a car with a passenger airbag. (False)	65.8%	77.7%	+11.9%
17. Children should remain in a harnessed car seat (rather than a booster seat where the adult seat belt goes in front of the child's body) until age 5 or older. If their seat's height/weight limit allow, they should remain in that seat longer. (True)	78.7%	87.1%	+8.4%
18. Children 5 years and above should travel in a booster seat until about 1.35-1.45 metres tall. (True)	79.5%	87.5%	+8.0%
19. A 6-year-old can sit in the front passenger seat. (False)	69.9%	84.8%	+14.9%
20. Children can use an adult seat belt only when the seat belt fits (lap belt across upper thighs and shoulder belt across the chest) without a booster seat. (True)	71.0%	68.4%	-2.6%

Future Areas to Take Note of, and Going Forward

This is to our knowledge the first local study to specifically evaluate the awareness and skill sets of healthcare professionals in a tertiary children's hospital, before and after receiving training in child passenger safety. The baseline low rate of previously having attended teaching on child car restraints (3.2%) reflects an important knowledge gap to be addressed. Reassuringly, across all ten competency dimensions, the average self-assessed familiarity score increased substantially following training. For knowledge-based "true/false" questions, 17/20 questions showed an increase in the percentage of correct answers following training, with 3/20 questions having a marginal decrease in percentage of correct answers. For question 20, this may have been due to the lengthy statement resulting in difficulty interpreting the question. Taken together, these suggest that course participants' sense of self-efficacy in knowledge and skill sets increased with training, broadly translating into increased knowledge in the immediate and short-to-medium term post-training period (immediately following and up to 2 months post-course).

In terms of limitations, this study was designed to assess knowledge and familiarity with child passenger safety skill sets, rather than test actual skills in correct child car seat instruction and use. In addition, only immediate to short-medium term knowledge gains were assessed. We were not able to assess attrition of knowledge in this study. While the original study intention was to assess the awareness and skill sets of parents following instruction from healthcare professionals, the study was delayed by over a year due to the prolonged COVID-19 pandemic, precluding trainers from entering the hospital and trainees from gathering in large groups, as well as halting staff training due to exigencies of service. Fortunately, the widespread adoption of videoconferencing technology during the pandemic subsequently enabled remote mass training for large numbers of staff (which may have encouraged attendance compared to face-to-face training), and the emphasis was changed to focus on evaluating the training of healthcare professionals first.

The importance of "training the trainers" first was underscored by a cross-sectional survey of 274 US emergency physicians which showed that while 85% endorsed including child passenger safety information in discharge instructions, only 36% correctly answered all knowledge questions, suggesting that inadequate training is an important potential barrier to injury prevention education.¹¹ With respect to the ideal training modality, both hands-on skills training and online child passenger safety education were effective at improving long-term (after 6 months) child passenger safety knowledge in paediatric trainees, while long-term installation skills for child car seats persisted only for hands-on education.¹²

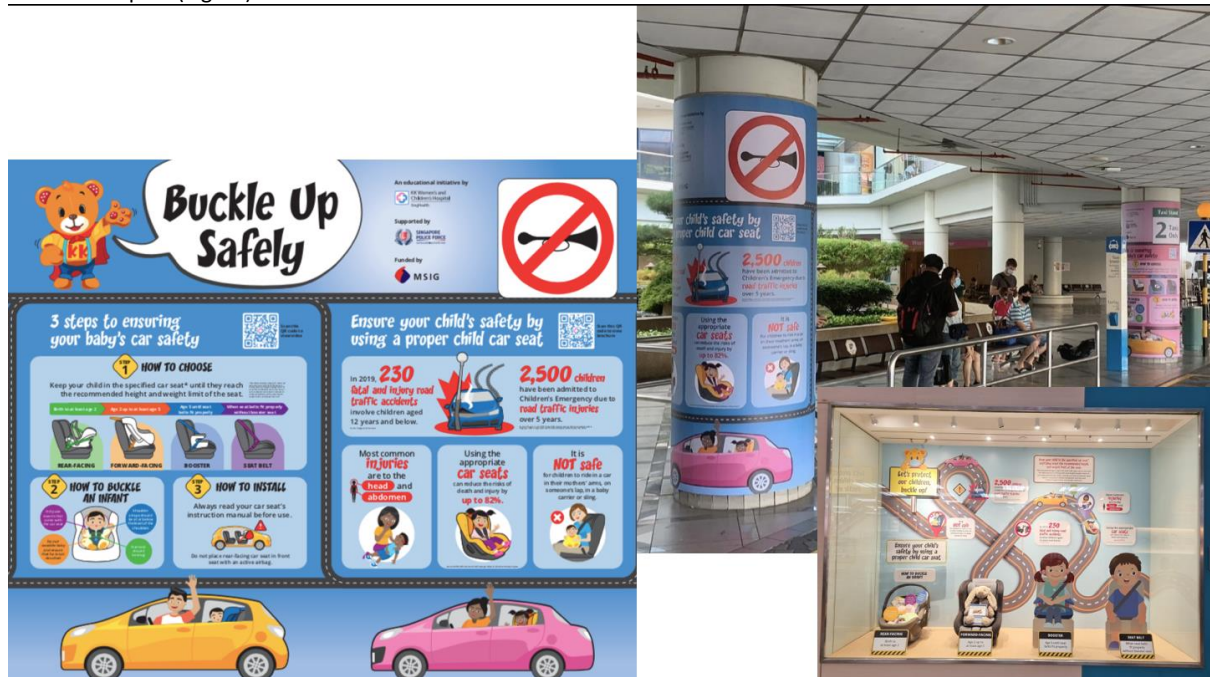
To maximise these gains in healthcare professionals' awareness and skill sets, a multi-pronged approach encompassing other aspects of injury prevention is ongoing, including targeted training of selected hospital staff with the US child passenger safety qualification to develop a newborn car seat discharge programme; public education (for instance, floor-to-ceiling educational displays installed at the hospital taxi stand); evaluation of hospital injury surveillance data and sharing of information with key stakeholders such as the Traffic Police to facilitate enforcement and environmental changes.

Means of Official Announcement of Research Results

This study is submitted for publication in an academic journal.

Note: Additional MSIWF grant-funded components include the following:

1. **Child Passenger Safety course** (in-person training when pandemic restrictions were subsequently eased) conducted over 4 days from 17-20 November 2021 for 11 hospital senior nurses, with appropriate safe distancing measures in place. This course equips participants with detailed knowledge and skill sets to train parents on the correct installation and use of child car seats. Course participants were accredited with the CPST certificate from Safe Kids Worldwide, with the qualification being valid for 2 years. They will help to further develop the hospital newborn car seat discharge programme.
2. As a compulsory component of the above CPST course certification and with approval from the hospital administration, a public “**car seat clinic**” was conducted in the hospital car park on 20 November 2021, in which course participants assisted families with child car seat installation under supervision from CPST instructors. This car seat clinic was open by appointment to hospital staff and the public. 12 different families attended the car seat clinic and received assistance with correct child car seat installation and use.
3. **Public educational materials** on child car seat safety were developed for display at the hospital taxi stand and within the hospital (Figure).



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