

Project Title

Prevention of Catastrophic IV insulin overdose using the Insulin Guard

Project Lead and Members

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Organisation(s) Involved

Changi General Hospital

Aims

To provide a sustainable solution with the best practice to eradicate IV insulin overdose, protecting patient and staff from the error.

Background

See attached

Methods

See attached

Results

See attached

Lessons Learnt

1. Innovative ideas with support from the institution

Most RCA focused on education of staff and preparing hyperkalemia kits with reminder notes in the kits. However, we find that lapses of attention from human error would take more than education or written reminders. Therefore we took the innovative journey to use design and innovation to prevent the usage of non-insulin syringes that would bypass human error.

2. Gathering like-minded team with buy-in from all users is important.

We encountered some difficulties initially as infection control team was not on board, therefore we had to take time to get their buy-in, by addressing their concerns and adjusting the design of the insulin guard, as well as emphasising the importance of the insulin guard in preventing another catastrophic insulin overdose

Conclusion

See attached

Project Category

Care Redesign

Keywords

IV Insulin, IV Actrapid, Root Cause Analysis, Diabetes, Hyperkalemia, Insulin Guard, Care Redesign, Changi General Hospital

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Prevention of Catastrophic IV insulin overdose using the Insulin Guard

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Background

Catastrophic IV insulin overdoses can cause irreversible neuroglycopenia, cardiac arrhythmias, seizures or even death. For these patients, they had prolonged length of stays, requirement to transfer to an intensive care unit for insertion of lines for concentrated glucose infusion as well as close monitoring. Patients are also at risk of developing hospital-acquired infections.

“ We aim to provide a sustainable solution with the best practice to eradicate IV insulin overdose, protecting patient and staff from the error. ”

Analysis

Multidisciplinary Root Cause Analysis (RCA) team reviewed the workflow of IV insulin administration, particularly for the treatment of hyperkalemia where these events occurred.

The underlying cause of IV insulin overdoses stem mainly from the unfamiliarity of the user with drawing insulin, mental lapses when drawing insulin (due to familiarity with bolusing entire contents of other common medications), leading to the usage of the wrong type of syringe to draw insulin.



Dosages of IV insulin required are typically less than 10 units (0.1ml), therefore, it requires special insulin syringes to withdraw and not the usual 3, 5 or 10ml syringes used for other IV medications.

Methodology

The team embarked on an innovative journey together with CGH's Office of Innovation (OOI). With a human-centered approach, the team studied the workflow and processes and conceptualised a series of ideas that enable absolute prevention of the usage of the non-insulin syringe.

The team uses 3D printing to develop in-house prototypes of physical barriers that prevent non-insulin syringe from accessing the contents of insulin vial. The tangible prototypes enable the user to conduct feasibility studies and evaluate its effectiveness and ease of use.

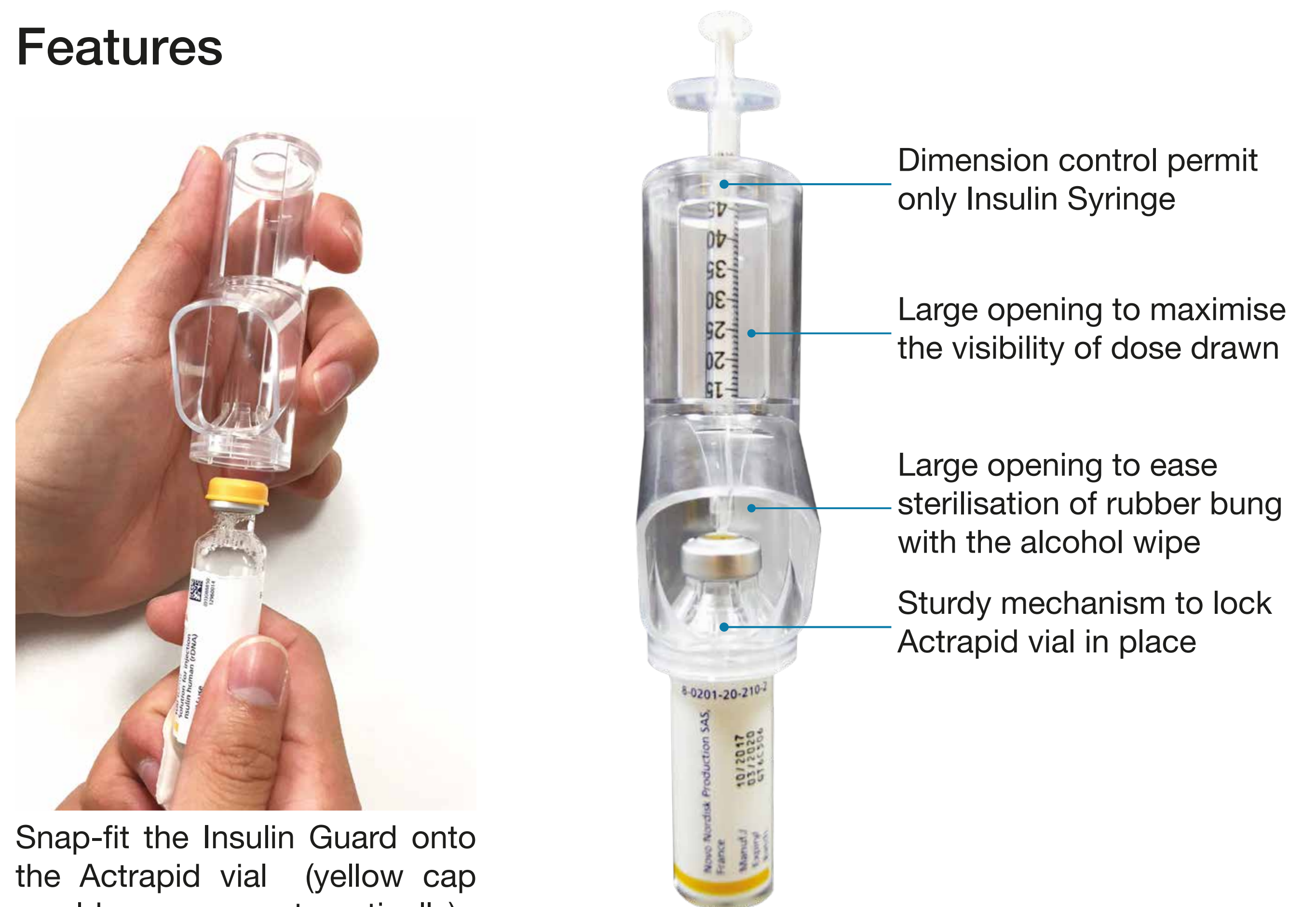


Series of prototypes created from validation.

With the finalised specification CGH engage a vendor to produce Insulin Guard to ensure:

1. Stringent dimensions control that limits only insulin syringe to access the rubber bung of Actrapid vial.
2. Easily affixed onto the Actrapid vial.
3. Sturdy and robust material to ensure difficulty in breaking off the guard.
4. Material with high clarity to ensure that visibility of dose drawn is not compromised.
5. Easy to clean both on the inner and outer surfaces of insulin guard.
6. Keeping the manufacturing cost of Insulin Guard low it will be disposed after each vial.

Features



Snap-fit the Insulin Guard onto the Actrapid vial (yellow cap would pop open automatically).

Drawing Procedures



Step 1
Bring the insulin syringe close to the opening of the disinfected Insulin Guard.

Step 2
Carefully insert the syringe through the opening until the needle punctures the rubber bung of the vial.

Step 3
Draw the required amount of insulin and withdraw the syringe from the Insulin Guard with care.

Results

There have been no cases of adverse medication since hospital-wide implementation over the last 1 year. Further monitoring would be necessary since the average event rate had been 3 cases in 5 years for CGH.

Conclusion

Insulin Guard has eliminated overdoses of IV insulin, enhancing patient safety - eliminate the risk of large overdoses of IV actrapid, prevented adverse outcomes for patients which includes death and brain damage. In addition, it avoided psychological impacts on our staff handling high alert medications frequently in the care of their patients.