

Patient Safety App: A Volume-based Enteral Feeding Calculator

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Abstract

Current clinical technology is often outdated. While medicine and doctors have improved their effectiveness over the past few decades and technology has reached amazing capabilities, many tools used in a clinical environment lack any automation or computer software to accompany them. Enteral feeding, a frequently used medical procedure, is an example of this disjoint relationship. The current method for determining feeding rates is lengthy and repetitive while also leaving large room for human error.

The calculations being made can easily be automated and presented to nurses in the form of an app. It is our team's job to develop this application and test it in both simulated and clinical environments. The application should take minimal input from nurses and provide them with the correct feeding rate and be released with open source to aid in deployment.

After development, the app will be taken into clinical trials to test its efficacy over the original hand-calculated method. To conduct trials our team must verify that we follow the rules outlined by the FDA and IRB.

I. Problem Description

Enteral feeding is the process of delivering liquid food through a tube into the stomach or intestine to ensure proper nutrition, medicine dosing, and patient health while a patient would be unable to eat normally. The volumetric method requires a repetitive, error-prone process performed by hand with a reference table to calculate the catch-up rate for the tube feeding. There are four different steps taken that could easily be automated. Human error is inevitable with this method and puts patients at an unnecessary risk.

The paper table is determined by a set of other calculations which are more time-consuming and error prone to calculate by hand but could be done quickly and reliably by software. Errors made when using this method are known to exist, however the actual frequency is unknown. We not only have errors being made, but also don't understand the full extent of these errors.

II. Proposed Solution

The app will automate as many steps as possible for the nurses. Less human interaction with a system known to work should reduce error. The accuracy provided by the volume-based method can then be made more accessible with a simple form style interface that accepts inputs from the user on the different inputs required by the table, including time since last feeding, volume per hour, and other factors.

The math driving the calculations of the program will be plain algebra; however, it should be wrapped into an application built for the most desirable interface (web, phone, tablet, etc.). The interface must also be intuitive for critical care nurses with a variety of backgrounds and technological expertise or lack thereof. Available critical care nurses will be surveyed through contacts of Dr. Judy Davidson to determine what platform is most common and familiar in a modern inpatient care environment. To verify that the proposed solution works clinical trials should be conducted with the new method and compared to data from trials that use the outdated method.

III. Performance Metrics

The success of the project will be evaluated on its accuracy, ease-of-use, and lack of errors. In addition, there will be checkpoints to denote major completed steps of the project.