FEASIBILITY OF SMARTPHONES AS A TOOL TO VERIFY ANESTHETIC MEDICATIONS

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Background: Medication errors remain a major patient safety issue in anesthesia, occurring in 1:131 to 1:5475 anesthetics. Work from the Institute for Healthcare Improvement has demonstrated that the most effective changes are ones that "attempt to change processes, not people" (1). Two process changes that have emerged are 'double-checking' and barcode labeling of medications. The practice of 'double-checking' has been estimated to detect 58% of anesthetic medication errors (2). Barcoding has been demonstrated to reduce errors and improve charge capture (3). The implications of wide implementation of these schemes have been studied in the British NHS (4), and several limitations noted. Two person identification requires the availability of two providers who are able to focus on the task, and barcode systems require significant changes in infrastructure. Both systems are subject to involuntary automaticity, in which the drug passes from drawer to patient without passing through the mind of the person administering it.

Smart phones have become ubiquitous amongst healthcare providers, and provide the capacity, in a single device, to encompass all features of double-checking and barcode identification. We sought to identify the elements required for such a solution and the capacity of current devices to meet these needs.

Requirements:

1. The system should use multiple communication modalities to confirm drug choice. The user should speak the name of the drug and scan the barcode.
2. The device should make a connection between the communication modalities – the spoken drug name and a scanned barcode must agree.
3. The system should incorporate geographic context – medications should ideally be checked in proximity to the patient, or at least in the location in which the patient will be.
4. Implementation of the system should be feasible with currently available technology

Assessment:

1. Speech input – While natural language processing is beyond the capacity of current devices, identification of one word from a fixed vocabulary is achievable. The open source package OpenEars was evaluated for this purpose and found to perform acceptably.
2. Barcode recognition – Numerous packages are available for consumer barcode dictionaries, however, pharmaceutical labels are encoded in GS-1 DataBar Limited. Modification of the open source package ZBar to support this standard is under evaluation.
3. Image recognition – While reliable OCR of medication labels is beyond the capability of current devices, 2D correlation of a limited dictionary of containers is possible. The open source package OpenCV was evaluated and found to be feasible.
4. Identification of geographic context by WiFi SSID is feasible, but not ideal. RFID solutions such as NFC and DASH7 are available as external readers currently, and will be incorporated into devices in the near future.

Conclusion: Software is available for current iOS and Android devices to perform double-checking of medications with barcode labeling, and perhaps with recognition of a limited set of medication containers. Validation of this technology in high fidelity simulation will be the next step in the process.

References

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