Integrating Smartphone Communication Strategy and Technology into Clinical Pharmacy Practice: A Mixed Methods Research Study
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Introduction
In 2012, the Vancouver Island Health Authority (VIHA) Pharmacy Department endorsed the iPhone® as the standard communication device for pharmacists. This was the result of a VIHA study which demonstrated that smartphone use reduced the time required to answer drug information questions, and improved confidence and competence in resolving drug therapy problems.
Other VIHA staff use a spectrum of communication technologies including personal and corporate smartphones, pagers, Vocera® hands-free badges, etc.
Use of such a diverse range of technologies has inherent issues, including but not limited to, 1) outdated technology (e.g. pagers), 2) unsecure and unencrypted data transmission (e.g. SMS messaging), and 3) absence of a central directory for VIHA employees’ mobile devices.

Uniqueness of Research
• Often technology is implemented without an objective assessment of the impact
• Mobile technology, primarily PDA use by physicians, has been studied and subjectively associated with positive outcomes; however, there is a lack of evidence to support smartphones as the primary communication tool
• To our knowledge, this is the first research study of an integrated smartphone communication app in a health care setting - and the first use of Vocera® Collaboration Suite (VCS) in Canada

Study Objective
To determine how the use of an integrated smartphone communications solution affects communication (and the efficiency of communication) between hospital pharmacists, physicians, switchboard operators, and ICU nurses/unit clerks compared to the current state

Methods
Design
Prospective, observational pilot study
• Multi-center: Royal Jubilee Hospital (RJH), Victoria General Hospital (VGH)
• Additional feasibility arm with 80% of participation

Inclusion Criteria
Pharmacists, Intensivists, ICU Clinical Nurse Leaders (CNLs), obstetricians, and hospitalists at RJH & VGH who use a corporate or personal iPhone® compatible with the app
Switchboard operators or non-physician ICU staff with access to desktop-based web console

Exclusion Criteria
• Project research team

Statistical Methods
• Mann-Whitney test of medians (primary outcome)
• Chi-squared approximation for 95% confidence intervals (secondary outcomes)

Outcome Measures
1. Page Turnaround Time
• Participating clinical & dispensary pharmacists recorded pages sent to physicians for 3 weeks before and 3 weeks with the VCS intervention
2. Usage Data
• Volume of messages and alerts received through app; aggregated by discipline
3. Survey Responses
• The entry and exit survey questions included five-point Likert scale questions and narrative feedback regarding:
  • Participant demographics and satisfaction of current communication method
  • Efficiency, accuracy, satisfaction, and drawbacks of new integrated smartphone communication app

Vocera® Collaboration Suite
• Three weeks pre-intervention
  • Page Turnaround Time Data Collection #1
• Three weeks post-intervention
  • Page Turnaround Time Data Collection #2

Table 1: Participants
| iPhone® App Users | n  | | Physicians | n  | | Swiftboard Users | n  | | ICU Staff | n  | | Pharmacists | n  |
|-------------------|----|---|------------|----|---|-----------------|----|---|------------------|----|---|
| 106               | 29 | 9 | Intensivists | 8 | Obstetricians | 8 |
|                   | 29 | 9 | ICU Clinical Nurse Leaders | 2 |
|                   | 29 | 9 | Pharmacists | 58 |
|                   | 47 | 17 | ICU Nurses & Unit Clerks | 30 |
|                   | 47 | 17 | Switchboard Operators | 17 |

Table 2: Number of messages received over 3 months (Nov 2014 – Feb 2015)
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<tr>
<th></th>
<th>Physicians</th>
<th>n</th>
<th>Swiftboard Users</th>
<th>n</th>
<th>ICU Staff</th>
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<th>Pharmacists</th>
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<td>Before VCS</td>
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Figure 1: Study Design
Figure 2: Median Turnaround Time of Pages sent to Physicians from Pharmacists

Table 3: Proportion of respondents who stated they “Agree” or “Strongly Agree” with the following statements
<table>
<thead>
<tr>
<th></th>
<th>Physicians</th>
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<th>Swiftboard Users</th>
<th>n</th>
<th>ICU Staff</th>
<th>n</th>
<th>Pharmacists</th>
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</thead>
<tbody>
<tr>
<td>VCS improved patient care</td>
<td>33.0%</td>
<td>14.9%</td>
<td>10.2%</td>
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<td>VCS improved patient safety</td>
<td>28.6%</td>
<td>9.1%</td>
<td>12.7%</td>
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<td>VCS improved medication management</td>
<td>18.1%</td>
<td>9.1%</td>
<td>16.7%</td>
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<tr>
<td>I would like to continue using VCS</td>
<td>61.0%</td>
<td>73.4%</td>
<td>18.2%</td>
<td>42.6%</td>
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Table 4: Positive aspects of Vocera® Collaboration Suite

Discussion
• VCS had extensive uptake into practice, indicated by 2808 alerts and 5691 chat messages received over a three month period.
• VCS produced a statistically significant reduction in the time it took for physicians to respond to pages (3.5 min vs 5 min). We hypothesize that physicians are able to page better pages with VCS since they receive more contextual information than just a callback number.
• Eighty-one percent of physicians stated that they wished to continue using this system. Physicians found that sending and receiving messages/pages using VCS produced a statistically significant reduction in the time it took for physicians to respond to pages (3.5 min vs 5 min). We hypothesize that physicians are able to page better pages with VCS since they receive more contextual information than just a callback number.

Conclusion
• Physicians respond to pages from pharmacists more quickly when using Vocera® Collaboration Suite (VCS). This increased efficiency of communication may result in improved patient care.
• Physicians and Switchboard Operators are supportive of replacing the current communication system with an integrated smartphone system.
• VCS use of an external battery pack is required to mitigate VCS battery issues.

References available on request

Results (continued)

Figure 3: Proportion of respondents who stated that sending or receiving pages improved patient care “Often” or “Very Often”

Figure 4: Proportion of respondents who were “Satisfied” or “Very Satisfied” with their current communication systems

Survey Response Rate
Survey #1: >70% for pharmacists; >30% for physicians, switchboard, and ICU staff
Survey #2: >80% for pharmacists, physicians, and switchboard; >30% ICU staff

Figure 5: Page Turnaround Time Data

Next Steps
• This research provides evidence to continue the use of Vocera® Collaboration Suite
• This project will inform Island Health’s future Communication Strategy
• Results will be shared at various Canadian events