



## ISMP Canada Safety Bulletin

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### Implementation Planning for a Medication Bar Code System

The Canadian Pharmaceutical Bar Coding Project was a multi-year, multi-stakeholder national initiative designed to establish a pan-Canadian approach to automated identification of medications along the entire supply chain and medication-use system, from pharmaceutical manufacturers to the patient's bedside. The project was co-led by the Institute for Safe Medication Practices Canada (ISMP Canada) and the Canadian Patient Safety Institute (CPSI) and was guided by a national advisory committee with 12 members, as well as a technical task force with 36 members from 6 healthcare sectors. The project has been widely endorsed by major Canadian healthcare practice and health quality organizations.\*

The project got started in 2009, and a recommendation was made for the adoption of the GS1 global standard for automated identification (e.g., bar coding). In 2012, version 2 of the *Joint Technical Statement on Pharmaceutical Automated Identification and Product Database Requirements*<sup>1</sup> was issued, along with 2 supplements.<sup>2,3</sup> With the October 2013 release of the 200-page document entitled *Medication Bar Code System Implementation Planning: A Resource Guide*,<sup>4</sup> the multi-phase project is now complete.

Evolution of the global GS1 standards for bar coding and other automated methods will continue, as will the need to incorporate selected aspects of new standards into innovative medication practices. ISMP Canada, in collaboration with its many stakeholders,

will continue to provide stewardship for use of this technology to advance medication safety.

#### Background

Medication errors have been widely acknowledged as a significant problem in healthcare. Although the reported rates of adverse events caused by medication errors vary, there is strong agreement that patient harm caused by such events is unacceptably high, especially considering the mostly preventable nature of these events. Similarly, studies investigating the use of automated identification to reduce errors through medication verification have consistently shown reductions of 50% or more in errors occurring at these points in the medication-use process.<sup>5-7</sup> Such practices can improve safety when employed during pharmacy compounding and dispensing and during bedside administration of medication doses to patients.

Despite these documented benefits, a recent survey showed that only 5% of Canadian hospitals have automated identification of any type at the point of medication administration<sup>8</sup>, and it is suspected that the rate of implementation of, or planning for, bar-code systems is even lower in Canadian community-based care. In contrast, approximately 50% of US hospitals surveyed had achieved this process improvement.<sup>9</sup> The Canadian Society of Hospital Pharmacists has called for national action on automated (machine-readable) verification.<sup>10</sup>

\* The project website, including endorsements from leading Canadian organizations, is available at: <http://www.ismpcanada.org/barcoding/index.htm>

## Medication Bar Code System Implementation Planning: A Resource Guide

The resource guide for implementation planning is designed for practice and executive leaders, as well as practitioners, in both community-based (e.g., long-term care homes) and institutional care (e.g., hospitals) settings. It was reviewed by more than 20 leading practice experts from various disciplines and practice settings. The resource guide provides detailed reviews of both acquisition and implementation strategies for bar code-assisted medication systems.

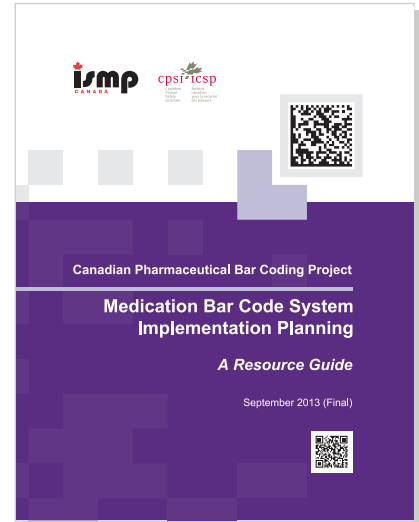
*“In order for bar coding to improve patient safety, nurses and other healthcare providers also need a clear understanding of how the technology works and how to use it to support their practice.”*

*Barb Mildon, President  
Canadian Nurses Association*

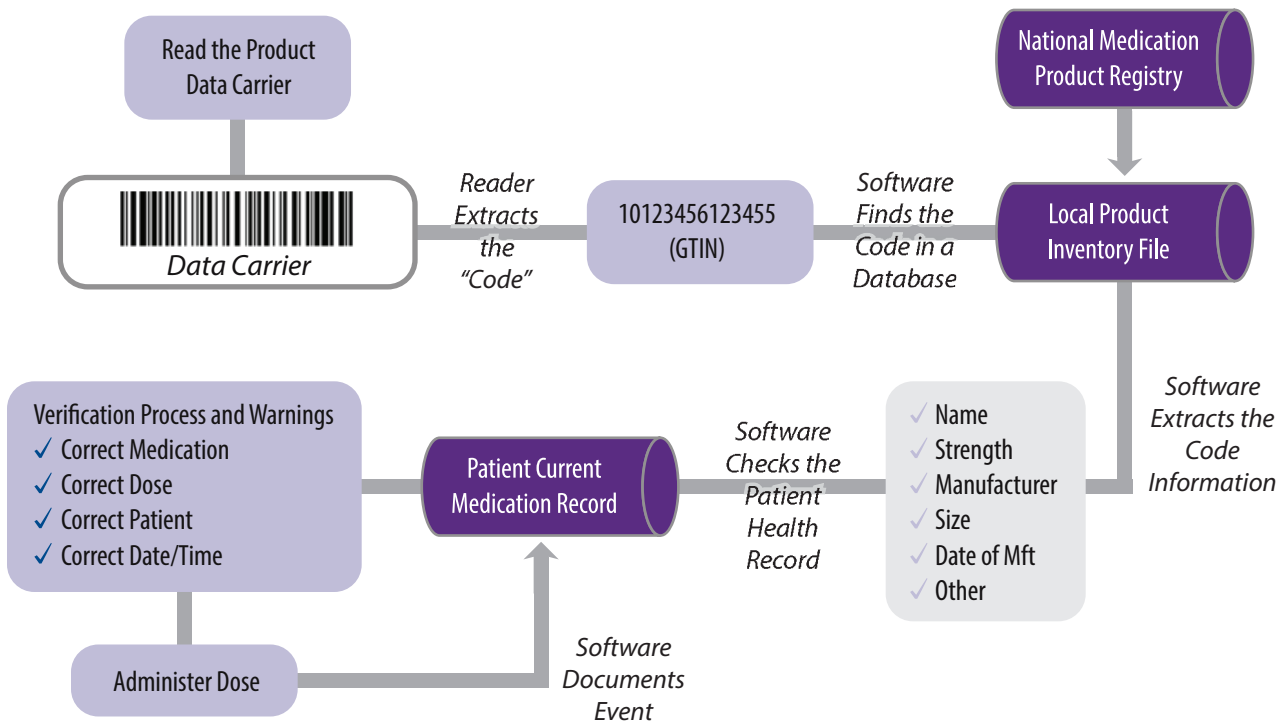
The document begins with a synopsis of recommendations and findings. This synopsis is followed by three detailed sections describing the strategic discussions that are needed for implementation, as outlined below.

### A Bar Code Primer







The “primer” section explains, in simplified terms, how bar coding achieves verification of patients, medications, and services, including how additional data are obtained and documented in an improved manner during the verification process. Figure 1 shows a simplified automated identification and data capture system for bar code medication administration. Figure 2 shows various forms of bar codes (symbolologies), indicating how certain bar code types may be better than others for specified medication (or other) practices.



**Figure 1:** Flow diagram of information verification with bar code medication administration



**Figure 2:** Different forms of bar code symbology

BAR CODE SYMBOLOGY	SUMMARIZED FEATURES
<p><b>UPC A (GTIN 12)</b></p> 	<ul style="list-style-type: none"> <li>• One-dimensional</li> <li>• Omnidirectional</li> <li>• 12 Character (others exist for 8 and 13 character versions also)</li> <li>• Numeric characters Only</li> <li>• Allows GTIN-12 (12 character GTINs only)</li> <li>• Point of Sale</li> </ul>
<p><b>GS1 DataBar (GTIN 14)</b></p> 	<ul style="list-style-type: none"> <li>• One-dimensional</li> <li>• Omnidirectional</li> <li>• 14 Character (GTIN 12 or 13 character versions are also allowed, if the GTIN number is padded with zeroes (0) on the left to make up the full 14 character string)</li> <li>• Numeric characters Only</li> <li>• Allows GS1 Application Identifiers (GTIN and others)</li> </ul>
<p><b>GS1 DataBar Expanded</b></p> 	<ul style="list-style-type: none"> <li>• One-dimensional</li> <li>• 74 Numeric or 41 alphanumeric</li> <li>• Omnidirectional</li> <li>• Allows GS1 Application Identifiers (GTIN and others)</li> </ul>
<p><b>GS1- DataBar Composite</b></p> 	<ul style="list-style-type: none"> <li>• Mixed one-dimensional and two-dimensional</li> <li>• Allows GS1 Application Identifiers (GTIN and others)</li> </ul>
<p><b>GS1 Data Matrix</b></p> 	<ul style="list-style-type: none"> <li>• Two-dimensional, compact</li> <li>• Can be etched on metal</li> <li>• 3116 Numeric or 2335 alphanumeric</li> <li>• Allows GS1 Application Identifiers (GTIN and others)</li> <li>• Camera-based readers required</li> </ul>
<p><b>GS1 QR Codes</b></p> 	<ul style="list-style-type: none"> <li>• Approved for product or customer information (e.g., information websites)</li> <li>• Not approved yet for use in product automated identification.</li> </ul>

***Building the Strategic Case for Automated Identification of Medications***

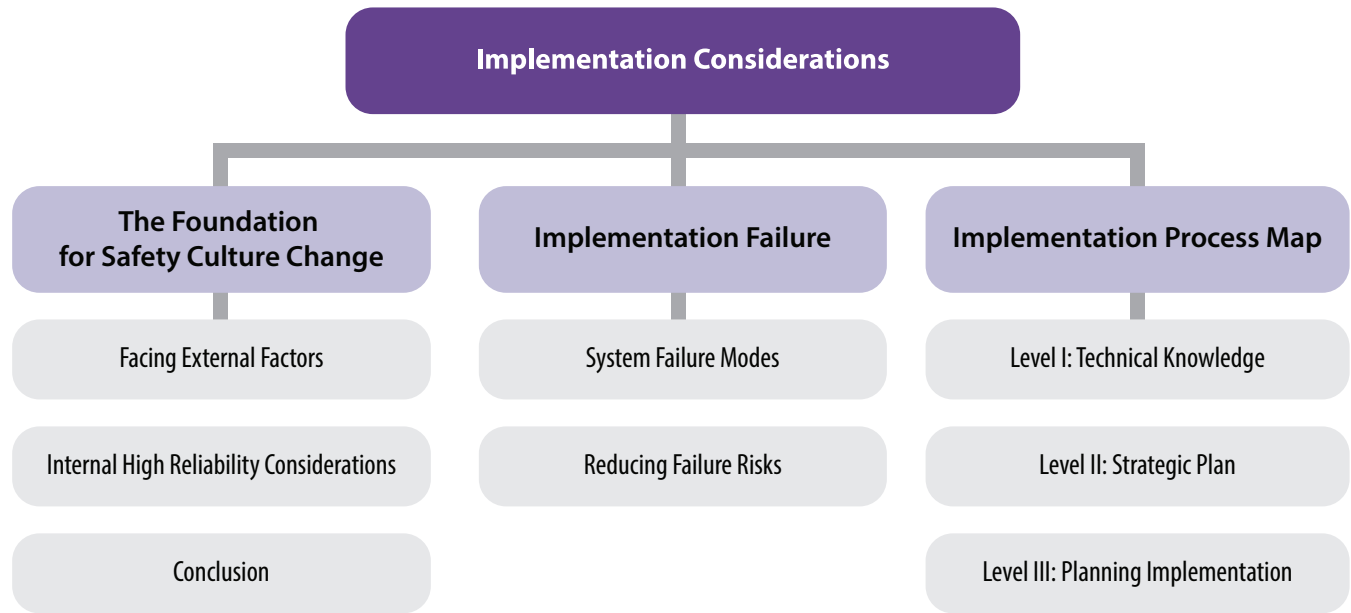
The second detailed section explains the primary and secondary impacts of medication bar coding, including reductions in medication errors and patient harm, avoidance of secondary and tertiary effects of errors, and decline in wasted healthcare expenditures related to such errors, from both local and system-wide perspectives. The section also includes a discussion of high-reliability organizations which adhere to principles for “designing out” failure and achieving heightened quality. These principles are reviewed and the bar coding process is compared, to show how implementation of bar coding can align with achieving high-reliability organizations within healthcare.

The section concludes by reviewing recommendations from other leading organizations and reporting five Canadian success stories.

***Implementation Considerations***

Lack of attention to detail in acquisition, testing, and implementation planning often results in failure of system reform, which in turn leads to frustration among healthcare providers, withdrawal of involvement, and lack of commitment. This failure will result in diminished compliance by users and implementation of hidden work-arounds, ultimately reducing practice consistency and quality on all fronts.

**Figure 3:** Considerations for implementation of new technology



This section also reviews external and internal (cultural) influences on technology implementation. Known implementation failure points are identified, and recommendations are made for improving acquisition planning through requests for proposals, software functionality checklists, and progressive usability testing of the system in different clinical and urgency situations. Involvement of healthcare providers as equal partners in development of the system is of paramount importance. Pre-implementation sessions with staff are needed, both to develop a culture of safety and to emphasize partnership. These sessions should be followed by staged training strategies. During and after implementation, a progressive “go-live” approach and survey process are recommended.

**Conclusion**



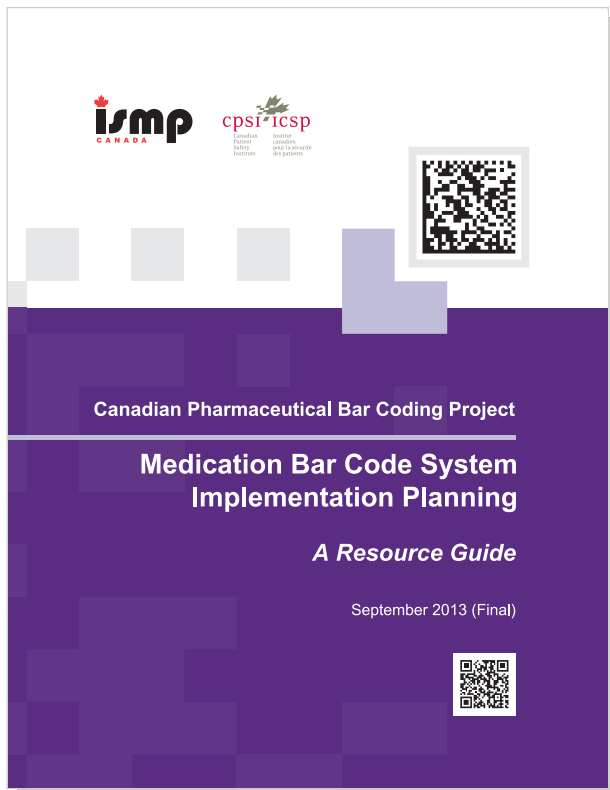
*Working together is key to reducing the potential for medication errors. Common standards and sharing of best practices can enable more effective use of technology in patient care environments so as to help Canadians and their healthcare providers to achieve safer medication practices.*

*Richard Alvarez, President and CEO  
Canada Health Infoway*

Two previous bulletins outlined the development of the national pharmaceutical bar coding project and the recommendations for pharmaceutical bar coding that have been made as a result of this collaborative effort.<sup>11,12</sup>

For health system innovation to take root, practitioners’ voices must be heard. You and your organization can help to spread the word about the need for system reform by using the resource guide and undertaking the following activities:

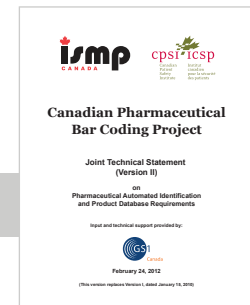
- Contact your professional practice organization, ISMP Canada, or CPSI and add your endorsement.
- Discuss medication bar coding processes with your facility’s practice leaders.
- Meet with your organization’s senior executives, including the CFO and CIO, to ensure they are aware of the benefits and values of automated identification strategies.
- Start discussing implementation issues, such as required system functionality and usability testing, and engage your information system provider(s).



## Medication Bar Coding Reduces Serious Errors

Medication bar coding practices significantly reduce serious errors and patient harm, while improving both the patient care *environment and electronic health record documentation*. Find out more about the movement toward improved care and access the 200-page *Medication Bar Code Implementation Planning Resource Guide* and other important information.

[ismp-canada.org/barcoding](http://ismp-canada.org/barcoding)



### Acknowledgements

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The Canadian Medication Incident Reporting and Prevention System (CMIRPS) is a collaborative pan-Canadian program of Health Canada, the Canadian Institute for Health Information (CIHI), the Institute for Safe Medication Practices Canada (ISMP Canada) and the Canadian Patient Safety Institute (CPSI). The goal of CMIRPS is to reduce and prevent harmful medication incidents in Canada.



The Healthcare Insurance Reciprocal of Canada (HIROC) provides support for the bulletin and is a member owned expert provider of professional and general liability coverage and risk management support.



The Institute for Safe Medication Practices Canada (ISMP Canada) is an independent national not-for-profit organization committed to the advancement of medication safety in all healthcare settings. ISMP Canada's mandate includes analyzing medication incidents, making recommendations for the prevention of harmful medication incidents, and facilitating quality improvement initiatives.

## Report Medication Incidents

(Including near misses)

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