

The motivation for the *Northern Lights* project stems from the severe limitations of existing Electronic Medical Record (EMR) systems. Patient information in EMRs is saved as plain text and “siloes” by professional sector. As a result, a caregiver looking up a specific detail about a patient has no choice but to read through file after file from doctors, nurses, lab tests, and so on, looking for the latest version of the information. Moreover, the EMR systems are slow to access and save information, their interfaces are clumsy to use and force doctors to go through numerous pages and textboxes to find the correct place to enter new information, and they can only be used from specific computers in the physician’s lounge.

These limitations have clear negative consequences for the Canadian healthcare system. Caregivers often choose not to use EMR systems for these reasons, and prefer to print out patient files at the beginning of their shifts, to take their notes on paper as they work, and to enter only some crucial points into the EMR at their end of their shift and destroy the paper notes. This means that a large portion of the observations caregivers make on patients are never entered into the system and are simply lost. Moreover, this inefficient system leads to caregivers spending as much as 40% of their time on tedious and repetitive documentation tasks. This also leads to coordination problems in larger teams, as one caregiver will not have access to the latest patient information that another caregiver has only written on paper. And finally, this creates a large amount of paper waste in hospitals, and creates the risk that notes containing confidential patient information could get lost.

The *Northern Lights* project aims to remedy this situation by creating a new medical documentation software system that provides new functionalities to address all these problems. Some of these functionalities are based on those already in use and proven to work in other areas, namely in the software development industry where efficient synchronous and asynchronous collaboration between multiple workers on a single large and complex program is commonplace. These functionalities include:

- Version control, to make it possible to know which caregiver change what information when;
- A to-do list for each patient, to keep track of what has been done and what tasks remain;
- Keyword detection and auto-completion, to make writing down notes simpler and faster. For example, when a caregiver types in a medication name, the system would automatically detect it as such and give completion options for dosage, frequency, and intake method.

- Intuitive mark-up tags. A sentence ended by a ? is automatically detected as a question a caregiver has about a patient. Ending a sentence with a ! marks it as an important note, while writing a sentence between () marks it as an off-the-record note that should not be saved in the EMR and the patient file. The aforementioned to-do list is also implemented with mark-up tags, namely a – for a task to do and a + for a task done.

The *Northern Lights* system includes both a regular text editor that can be installed on a desktop or laptop computer, and a simpler interface for mobile devices. The mobile device interface makes it possible for caregivers to consult the latest version of the patient’s file as they are doing their rounds in the hospital. And thanks to the keyword detection and markup annotation in the document, it is possible for us to design a simple and non-cluttered interface that directly displays the information caregivers want to see.

The potential for future expansions of the system is all but endless. A frequently-requested improvement is to make the mobile device interface even easier to use by adding in voice recognition technology, to allow caregivers to dictate their notes directly into the patient’s file. The system can also be made more “knowledgeable” of medicine. For example, since our system can already detect medications in the patient’s file, a logical next step would be to add a drug ontology that would allow it to detect conflicting prescriptions. On the other hand, since the patient file is basically text, we can make use of natural language processing methodologies, for instance to automatically summarize larger files and highlight the crucial facts. Finally, social networking tools could be included to allow caregivers to message each other with links to patient files and requests for options, tests or treatments.

The benefits of these new features will be to improve the documentation tasks that caregivers need to go through, by making it easier and faster to write and use documentation and by automating the more tedious and repetitive parts of it, and this in turn will free up more time for caregivers to do what they want to do – give care to patients. Moreover, by relying on plainly-written text and a few intuitive mark-up tags, the system will have only a small and painless learning curve. Finally, it should be noted that *Northern Lights* is designed to be integrated on top of the hospital’s existing EMR system. This means that hospitals will not have to get rid of the EMR systems that they have already invested a lot of time and money in acquiring and installing. Moreover, the EMR are proven technology for reliable and secure storage of the information – *Northern Lights* can thus focus on making the information easy to access and edit, and useful for caregivers.