In 2001, University Health Network (UHN) consisted of three hospitals:

- Toronto General Hospital (TGH): 471 beds specializing in General Internal Medicine (GIM), cardiology and Multi-Organ Transplant (MOT)
- Toronto Western Hospital (TWH): 256 beds specializing in neurology and orthopedic surgery
- Princess Margaret Hospital (PMH): 220 beds specializing in medical and radiation oncology, malignant hematology, autologous and allogeneic Bone Marrow Transplant (BMT)

CPOE was implemented at TGH and TWH but not at PMH due to system constraints regarding safe ordering and processing of oncology medication protocols.

Workflow and patient safety challenges emerged during patient and information transfers between PMH and other sites due to different interfaces.

Fifteen years later, UHN now consists of five hospitals and strives to become a High Reliability Organization (HRO).

Adaptation of CPOE into the PMH (now called Princess Margaret Cancer Centre) medication system is revisited and a proposal to adapt the current CPOE system from TGH and TWH to PMH is undertaken to improve patient safety.

Due to the hybrid system, “chemotherapy on paper” flag was built in CPOE to allow the prescriber to enter a notification for new chemotherapy starts, and to be discontinued when the entire protocol is finished.

Consistencies were discovered in a previously built, existing medication list, e.g. infusion instructions, some were standardized as time permitted during the PM MOE/MAR project.

A number of previously built medication orders were discovered to be not built according to policy and procedures, and were corrected in preparation for PM implementation, e.g. acetylsalicylic acid medication orders were not standardized at mealtimes as per Standard Medication Administration Time (SMAT) policy.

Significant inventory discrepancies existed between operations and many other interface std for customization.

QM/MM-BDM interface issues were identified or escalated, and required resolution withvendors orworkbuilds, e.g. time delays for needed medications and discrepancies in the CPOE system due to standardization of certain medication orders, and labeling discrepancies for weight based antimicrobials.

Vascular Thromboembolism (VTE) prophylaxis policy was updated and a corresponding forced function order set was updated to ensure mandatory documentation takes place on each patient admission, as per Accreditation standard.

Many committees from both TGH and PMH sites were required to standardize pre-printed order sets and order screen updates to ensure the medication profiles are in the CPOE system prior to implementation ideally should have been discovered and addressed proactively earlier.

The shear number of pre-printed order sets were processed and updated within a short timeframe required fast track update review by disease site leads and Oncology Subcommittees as well as Pharmacy and Therapeutics Committee.

CPOE scope for each was then delineated and a central storage area on the Intranet was created for future use.

CPOE is required to share the same medication database as TGH due to cost sharing for inpatient visits, despite different patient population needs.

Therefore a multi-site medication analysis was necessary to standardize practices if possible for all sites (please see Fig 2).

Drug shortages were expected due to different medication dispensing processes downstream with deployment of single CPOE system, e.g. different label printer routing and dispensing locations.

Safe features were designed for oncology medications such as Body Surface Area (BSA) and weight based calculators for dosing and additional oncologist signoff.

Update of policy and procedure documents to include oncology restrictions for medications, e.g. immunosuppressant policy for BMT in addition to MOT; E - form for BMH use.

New workflow processes were designed for dispensing and information transfer in PMH to prepare for implementation.

Human factors analysis was done and risk factors were identified for new workflow processes.

QMP on downstream applications were investigated with respective project teams, e.g. discharge summary and medication reconciliation application upgrades due to occur simultaneously.

Implementation:

- Primary users (physicians, nurses and pharmacists) were trained within two weeks before launch.
- Implementation occurred simultaneously throughout the entire PMH due to potential patient safety risk from patient transfers between units in the hospital if a staggered approach is used.

CPOE scope was delineated by all pharmacists for each medication profile on their clinical unit prior to implementation, and all in scope medications were then entered by 50 pharmacists from all sites the weekend prior to implementation to ensure the medication profiles are in the CPOE system.

Successes (Highlights):

- Rapid uptake across entire hospital due to strong support from project team and informatics hub.
- Automatic medication order transfers between sites and units needed reduce for transcription and duplication.
- Prescriptions are easier of entry and access to patient medication profiles from any computer terminal in the entire organization.
- Time saved in reducing need to print paper MARs and reduced to receive paper orders prior to implementation. Current web application still applies to chemotherapy orders.
- Further medication safety benefits are being evaluated, such as anticipated increased VTE prophylaxis documentation (Fig 2).

QMP system scope and implementation in PMH: 65% of medications are影视剧 in CPOE system.

Challenges (Highlights):

- Confusion over which medications are ordered on paper vs. CPOE (Fig 7).
- Disinformation regarding locational quality order sets designed for some commonly used medications, e.g. subcutaneous routes of medications were only found in the palliative care common medication order screen.
- New QCRI-BDM interface issues were identified post implementation e.g. unintended alternation in scheduled start/dates times medication orders when patients are pre-admitted.
- Unintended changes in pre-printed order set updates were promptly corrected.

Conclusions:

- Converting a paper-based oncology hospital site to CPOE in order to align with existing CPOE hospital sites caring for different patient populations within one organization has its unique challenges and opportunities.
- Refinements new design system philosophies to accommodate two very different practice sites for the first time, and overcoming challenges with standardizing clinical practice and operations between sites.
- Existing CPOE system interface challenges and less than optimal builds that were unknown or not addressed prior to implementation ideally should have been discovered and addressed proactively earlier.
- We hope our experience will serve as a valuable resource for any considering CPOE implementation within large complex centers under similar circumstances.

Disclosure: The authors have nothing to disclose.

Acknowledgments: The authors would like to thank all members of the project team and steering committee:

- the pharmacy informatics team;
- the Patient Care Management System (PCMS) team;
- and all clinical and operational project leads

for their tremendous support and effort on this endeavor.