**ABSTRACT**

**Background:** Formulary management is a key component to ensuring the safe, effective, and fiscally responsible use of medications for health systems. One challenge in the formulary management process is making the most relevant formulary information easily accessible to practitioners involved in medication therapy decisions at the point of care. In September 2014, Froedert and the Medical College of Wisconsin (F&MCW) implemented a commercial formulary management tool (CFMT) to improve accessibility to the recently aligned health-system formulary. The CFMT replaced an internally developed formulary management tool.

**Objectives:** The primary objective was to determine pharmacist end-user satisfaction with accessibility to system formulary and formulary-related information through a new CMFT compared with the historical formulary management tool (HFMT). The secondary objective was to measure the use of formulary-related information in the CFMT and HFMT.

**Methods:** The primary objective was measured through pharmacist end-user satisfaction surveys before and after integration of formulary-related information into the CFMT. The secondary objective was measured by comparing monthly usage reports for the CFMT with monthly usage reports for the HFMT.

**Results:** Survey respondents reported being satisfied (52.5%) or very satisfied (18.8%) more frequently with the CFMT compared with the HFMT (31.7% satisfied and 2.5% very satisfied). Between October 2014 and January 2015 the frequency of access to formulary-related information increased from 92 to 104 requests per day through the CFMT and decreased from 47 to 33 requests per day through the HFMT.

**Conclusions:** Initial data suggest incorporating system formulary-related information and related resources into a single platform increases pharmacist end-user satisfaction and overall use of formulary-related information.

**INTRODUCTION**

Hospitals and health systems have used formularies since the 1940s. Over the last seven decades, formularies have evolved from simple medication lists into comprehensive systems of medication policies that help to ensure safe, effective, and cost-effective use of medications. In that time, formulary use not only became standard practice, but a requirement for reimbursement by the Centers for Medicare and Medicaid Services (CMS) and accreditation by The Joint Commission. The Joint Commission has specific requirements for managing formularies, which include making the formulary readily available to those involved in medication management and communicating formulary changes to independent practitioners. Various methods have been used to ensure that formulary-related information is readily accessible to health care practitioners. Other health systems that integrated formulary-related information into an online commercial medication information database reported an increase in end-users accessing formulary-related information, a decrease in formulary-related phone calls to the pharmacy, and improved formulary management. In addition, commercial databases used to centralize formulary-related information, as with other online formulary management systems, allow for clear communication of changes after each P&T committee meeting. According to physician surveys, availability of current information is an important determinant of physician use of online formulary-related information on a consistent basis. In addition, clinical staff surveys have shown increased satisfaction with the formulary when formulary-related information was integrated into an online system. While Froedert and the Medical College of Wisconsin (F&MCW) already utilized an online formulary management system, there were concerns with accessibility, navigability, and general end-user satisfaction.

F&MCW is a three-hospital health system that aligned formularies from each site into a single, standardized system formulary consisting of approximately 890 medications. The health system formulary is also utilized by 28 primary care locations and four infusion clinics across the integrated health network. To help guide appropriate medication use, the system formulary and related documents were stored on a shared, homegrown intranet website (the historical formulary management tool [HFMT]) available to health care practitioners across the system. However, this intranet website was difficult to navigate and often required end-users to look in several places to find relevant formulary-related information. In addition, the HFMT was not accessible across all computer platforms, specifically at the affiliated medical college, limiting the information end-users could access at different health system locations. These factors created barriers to adherence with system guidelines, restrictions, therapeutic interchanges, and other decision-support resources. Finally, maintaining the system formulary and formulary-related documents using the

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The Missing Link: Evolving Accessibility to Formulary-Related Information

GLOSSARY OF FORMULARY TERMS

End-user—Any individual who uses the medication information database and the associated tools within it.

Formulary management tool—A system, generally electronic, used to store and organize formulary-related information.

Formulary-related information—Guidelines, policies, and other resources approved by the P&T committee used to guide medication use at all hospitals, clinics, pharmacies, and associated entities across the health system.

Formulary-related resource—A single piece of formulary-related information (e.g., guideline, policy, restriction, therapeutic interchange).

Commercial formulary management tool (CFMT)—An online electronic formulary service within a commercial medication information database (MID) allowing for the integration of formulary-related information.

Health system formulary—A single comprehensive list of P&T committee-approved formulary medications, available formulations, and associated restricted use criteria for use at all hospitals, clinics, pharmacies, and associated entities across the health system.

Information management system—The editing tool within the CFMT allowing for customization of hospital and health system formulary-related information. Allows content facilitators to easily incorporate information from the database, add relevant Web links, and build customized headers for convenient access to formulary-related information.

Medication information database (MID)—A resource that contains general medication information (e.g., indications, dosing, adverse effects, pharmacokinetics).

Pharmacist end-user—Any pharmacist who uses the MID and the associated tools within it.

HFMT was labor intensive, and interoperability between the formulary management tool and the electronic medical record (EMR) was limited.

In September 2014, F&MCMW implemented a new commercial medication information database (MID) to assist in formulary management and address the aforementioned issues. The selected MID, Lexicomp, was chosen because it provided general medication information, access to CMS-recognized drug compendia information, represented cost savings over the previously used MID, and had functionality to manage the hospital formulary and formulary-related information. Formulink, the commercial formulary management tool (CFMT) within the MID, was anticipated to be easier to access, navigate, and maintain than the HFMT; it also allowed end-users to search a single online database for both formulary-related information and general medication information. F&MCMW integrated guidelines, restrictions, therapeutic interchanges, and other formulary-related information along with general medication information into the CFMT based on a pharmacist workgroup survey. In addition, the MID met CMS interoperability criteria for meaningful use. Meeting these criteria indicates the software is able to exchange data with the system EMR in a way that both systems understand the structure and content of the exchanged information. MID interoperability can be used to enhance accessibility to formulary-related information and general medication information from the EMR.

The primary objective of this project was to determine pharmacist end-user satisfaction with accessibility to system formulary and formulary-related information through integration of formulary-related information into a single-platform CFMT. The secondary objective was to measure how frequently formulary-related information was accessed in the database compared with the HFMT.

METHODS

No patients were enrolled and patient data was not used in this descriptive project focused on formulary management optimization. Data collection, analysis, and reporting occurred from September 1, 2014, to January 31, 2015. Both the CFMT and HFMT were simultaneously updated and available to end-users during this time period, allowing the authors to compare frequency of use for each formulary management tool when end-users could choose between systems. The primary objective of this project was measured through pre- and post-CFMT implementation surveys of pharmacist end-users. The secondary objective was measured using monthly action reports of both the CFMT and HFMT. Monthly reports included the number of times per month F&MCMW formulary-related information was accessed.

Prior to conversion to the new MID and CFMT in September 2014, end-users were notified of the upcoming change and were encouraged to attend staff meetings in which F&MCMW faculty demonstrated how to navigate the new systems. Similar demonstrations for navigating the HFMT had been given to end-users in the past. With the new MID and CFMT, staff were also provided with temporary trial access prior to full integration to become more familiar with the tools in their daily workflows. Links to both the CFMT and HFMT were available in the EMR at the point of order entry and on the medication administration record to enhance accessibility to formulary-related information. This allowed end-users to review formulary-related information through either system at the point of order entry or medication administration. The CFMT provided advanced linking in the EMR by allowing direct access to a specific formulary medication while the HFMT could only link to the formulary, not a specific medication. The HFMT link in the EMR had been available prior to conversion to the new MID and CFMT and remained available until the HFMT was formally discontinued at the end of January 2015.

In September 2014, the new MID and CFMT became available to all health care professionals across the F&MCMW system. Initially, formulary-related information available in the CFMT was limited to a formulary list, available dosage forms, medication restrictions, and limited hyperlinks to other F&MCMW online resources. During the course of this project, other key formulary-related resources were integrated into the CFMT.

The initial survey was distributed to pharmacist end-users in September 2014 to assess satisfaction with the HFMT with a follow-up survey distributed in February 2015 to assess
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satisfaction with the CFMT. Both surveys were voluntary, electronically distributed, and remained open for two weeks. Information collected through the surveys included overall satisfaction with accessibility to the formulary, self-perceived time to search for formulary-related information, and the frequency of accessing formulary-related information. In addition, all information provided in the surveys was anonymous, and feedback was used to prioritize integration of key formulary-related information into the CFMT. Monthly usage reports were collected for both the HFMT and the CFMT between September 1, 2014, and January 31, 2015.

Formulary definitions can be ambiguous, vary among accrediting and national organizations, and may be applied differently depending on clinical practice models. A summary of definitions used in this project is provided in the Glossary of Formulary Terms.

DATA ANALYSIS

Descriptive statistics were used to report end-user satisfaction and monthly usage of the CFMT and HFMT. A chi-square test was used to compare the frequency with which formulary-related information was accessed in each formulary management tool between September 1, 2014, and January 31, 2015. Other outcomes were reported using descriptive statistics.

RESULTS

The initial satisfaction survey of pharmacist end-users at F&M CW had 79 responses, and the follow-up survey had 80 responses. The majority of survey responders in both the pre- and post-implementation surveys were inpatient decentralized pharmacists (49.4% and 51.3%) and outpatient ambulatory care pharmacists (29.1% and 21.3%). Additional characteristics of the survey responders are detailed in Table 1.

Survey respondents reported being satisfied (52.5%) or very satisfied (18.8%) more frequently with the new CFMT compared with the HFMT (11.4%).

### Table 1  Survey Respondent Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Initial Survey (N = 79)</th>
<th>Follow-Up Survey (N = 80)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Primary Area of Pharmacy Practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient retail</td>
<td>4 (5.1)</td>
<td>5 (6.2)</td>
</tr>
<tr>
<td>Outpatient ambulatory</td>
<td>23 (29.3)</td>
<td>17 (21.3)</td>
</tr>
<tr>
<td>Inpatient central</td>
<td>7 (8.8)</td>
<td>8 (10.0)</td>
</tr>
<tr>
<td>Inpatient decentral</td>
<td>39 (49.4)</td>
<td>41 (51.3)</td>
</tr>
<tr>
<td>Administration</td>
<td>6 (7.6)</td>
<td>9 (11.2)</td>
</tr>
<tr>
<td>Years at Froedtert and the Medical College of Wisconsin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 1 year</td>
<td>15 (19.0)</td>
<td>15 (18.8)</td>
</tr>
<tr>
<td>1 to 3 years</td>
<td>26 (32.9)</td>
<td>22 (27.5)</td>
</tr>
<tr>
<td>4 to 6 years</td>
<td>10 (12.7)</td>
<td>14 (17.5)</td>
</tr>
<tr>
<td>7 to 10 years</td>
<td>11 (13.9)</td>
<td>12 (15.0)</td>
</tr>
<tr>
<td>11 years or more</td>
<td>17 (21.5)</td>
<td>17 (21.2)</td>
</tr>
</tbody>
</table>

Between September 1, 2014, and January 31, 2015, end-users accessed the formulary-related information using the HFMT 6,493 times and the CFMT 16,319 times ($P < 0.0001$). See Figure 1 and Figure 2 for further details on survey responses.

DISCUSSION

When F&M CW transitioned to the new CFMT, it created a more accessible, user-friendly platform for accessing formulary-related information. The results of this project indicate that end-users were more satisfied with accessibility of information through the new CFMT compared with the HFMT. The results also show that formulary-related information was accessed more frequently through the new CFMT. The increased satisfaction with accessibility and increased frequency of access to formulary-related information demonstrate the benefits of using a single location to house key formulary-related information. Similar results were reported at another tertiary medical center that used the same MID and CFMT system and historically used a similar intranet page to communicate formulary information. At the tertiary medical center, the formulary was available through the CFMT, and institutional policies and guidelines were available only on the intranet. Following integration of three key formulary policies into the CFMT, 20% of pharmacy staff reported medication management information was much easier to access, and 50% reported access as somewhat easier. In addition, 50% of pharmacy staff respondents reported increased satisfaction with the online formulary after policy integration. A five-hospital health system also found improved satisfaction from staff after integrating formulary information—including therapeutic interchanges, drug policies, shortages, and clinical information pertaining to the system formulary—into a single online location using a commercial formulary management system. However, that study did not indicate whether “staff” included all clinical staff or pharmacy staff only.

There was improved satisfaction and more frequent use of the new formulary management tool at F&M CW throughout the course of the project, despite a transitional period.
that required end-users to access both tools. There were reports of dissatisfaction and difficulty locating necessary information following implementation of the CFMT. However, it is unknown if dissatisfaction was related to the CFMT itself, certain formulary-related information still being located on the HFMT and other intranet sites, or staff member lack of participation in pre- and post-implementation education. Although key formulary-related information, such as formulary restrictions and therapeutic interchanges, were incorporated into the new CFMT either upon implementation or soon after implementation, it was not possible to incorporate all pieces of formulary-related information immediately. Ongoing system alignment projects, such as medication treatment guidelines and collaborative practice agreements, will result in a continued need to incorporate formulary-related resources into the CFMT. With these updates and as end-users become more familiar with the CFMT, continued satisfaction with access to formulary-related information is expected.

When selecting groups to survey regarding satisfaction with access to formulary-related information, only pharmacists were chosen rather than all end-users (e.g., physicians, nurses). It was determined that pharmacists would be the most frequent users of the formulary management tool and that surveying other end-users would not provide as much beneficial information.

When considering how to present information through the new CFMT, there were two primary options. One option was to create formulary-related resources in the new CFMT. These resources would be developed directly in the information management system of the MID. The second option was to incorporate direct links to formulary-related resources into the new CFMT. Both options enable end-users to connect quickly to formulary-related resources utilizing the CFMT.

The advantages and disadvantages of each option were evaluated. Developing all content directly in the CFMT using the information management system allows for information to be located and updated in a single location. However, creating and maintaining these resources could only be done by super-users with editing access. In addition, this method would have required all existing formulary-related resources to be recreated in the CFMT. Using the Web links function in the CFMT to interface with an intranet site allowed use of existing documents and allowed content experts to develop and update documents that super-users could then link to specific medications in the CFMT. However, this method required formulary-related

![Figure 1: Pharmacist End-User Satisfaction With New and Historical Formulary Management Tool](image1)

![Figure 2: Pharmacist End-User Time to Complete A Single Formulary-Related Information Search](image2)
information to be located on the intranet site that was then linked in the CFMT, thus making the information available in two locations. A mix of both options was utilized when integrating information into the CFMT; however, the majority of content is supported by the Web links option. A process for updating the CFMT and intranet sites is in place to ensure consistency of content and hyperlinks between both locations.

LIMITATIONS

A potential limitation of the project was the lack of historical information on how frequently formulary-related information was accessed when only the HFMT was available. The authors were unable to obtain this baseline data due to software limitations in the historical tool, and as a result could not compare how frequently formulary-related information was accessed before and after the new CFMT was implemented. However, the frequency of access to each tool when both tools were available was evaluated to determine which resource end-users would select when given an option. End-users accessed the CFMT more frequently than the HFMT when both were available and linked in the EMR. This suggests the new tool was more user-friendly and had a greater potential for making important information available to front-line staff. However, the frequency of access to the new CFMT may have been increased due to searches within the MID. When a medication is searched in the MID and the medication is on the F&MCW formulary, the link at the top of the list leads to the CFMT containing F&MCW formulary-related information for that particular medication. This may be specifically reflected in the higher frequency of access to the CFMT in the first month it was available. However, each link indicates whether it leads to the CFMT containing F&MCW information or to the MID general medication monograph. As end-users learned which links led to the F&MCW formulary-related information and which to the monographs, they were presumably conscious of which link contained the desired information. This increased awareness may account for the decrease in frequency of access to the CFMT in subsequent months. In addition, the number of end-users could theoretically have increased after the conversion because the HFMT was not accessible in all locations associated with F&MCW. However, it appears more likely that there were the same number of total users before and after the conversion with expanded accessibility at the affiliated medical college after the conversion. An incidental finding during this project showed that, while the historical tool was being accessed on a regular basis, the individuals accessing the HFMT most frequently were those updating the resources located there.

In another potential limitation of this project, compliance was not measured with system formulary, policies, and guidelines before and after the new formulary management tool was implemented. This analysis was not completed because conversion to the new CFMT impacted all formulary medication, policies, and guidelines, and it was not feasible to measure compliance with all resources before and after the conversion. Potential metrics for compliance could include frequency of nonformulary medication use or frequency with which criteria for medication use were met; however, these metrics were not formally tracked prior to conversion. In addition, concurrent updates in other systems could confound compliance data. For example, therapeutic interchanges were standardized and integrated into the new CFMT and, at the same time, updated in the EMR. Assessing compliance with therapeutic interchanges before and after use of the CFMT would be confounded by the fact that the same information was made available in the EMR. In addition, therapeutic interchanges were updated to align across the system, which added some therapeutic interchanges and removed others at each site—making a before-and-after comparison unreliable. There was also lack of initial data on compliance with existing formulary-related resources prior to the formulary management tool conversion. However, data from previous studies indicate that provider accessibility to formulary-related information increases compliance with use of formulary medications and guidelines. Using these data, it is likely that as more resources are incorporated into a single formulary management tool, compliance with system restrictions, policies, and guidelines may improve.

CONCLUSION

Incorporating system formulary-related information and related resources into a single accessible platform increased pharmacist end-user satisfaction with accessibility and overall access to formulary-related information.

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Accessibility of Formulary Information

ACKNOWLEDGEMENT

The surviving authors dedicate this publication to the late Julie Karpinski, PharmD, BCPS, whose drive and dedication to this project and the profession of pharmacy were an inspiration.

REFERENCES