A Structured Nursing Intervention to Address Oral Chemotherapy Adherence in Patients With Non-Small Cell Lung Cancer

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Purpose/Objectives: To evaluate a nurse-led intervention to enhance medication knowledge and adherence using the Multinational Association for Supportive Care in Cancer Oral Agent Teaching Tool (MOATT).

Design: Longitudinal, descriptive feasibility study.

Setting: An ambulatory thoracic oncology disease center located at the Dana-Farber Cancer Institute in Boston, MA.

Sample: 30 adult patients with lung cancer who received the oral agent erlotinib.

Methods: Structured, nurse-led education sessions using the MOATT were provided, with a 72-hour follow-up telephone contact. Participants completed a Knowledge Rating Scale (KRS) and adapted Morisky Medication Adherence Scale–8 (MMAS-8) at the end of the first cycle of oral chemotherapy.

Main Research Variables: Knowledge and adherence; feasibility.

Findings: Twenty-seven participants completed the study outcome measures reporting high knowledge levels and MMAS-8 scores. Structured, nurse-led education and follow-up monitoring sessions ranged from 14–30 minutes. Several participants also initiated contact for assistance with prescription procurement and symptom management. Participants reported a median of two side effects.

Conclusions: The structured, nurse-led teaching, using the MOATT tool, and follow-up nurse contacts were feasible as integrated into the thoracic oncology setting. Adherence and knowledge outcomes were encouraging. Additional studies should include objective adherence measures and strategies for delivering supportive care to patients at home.

Implications for Nursing: Structured teaching with patients is important to enhance proper oral anticancer medication knowledge and adherence, including follow-up monitoring of administration and side effects at 72 hours.

Key Words: lung cancer; oral chemotherapy; adherence; knowledge; oncology nursing

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With the use of oral chemotherapies rapidly expanding in oncology practice (Halfdanarson & Jatoi, 2010), an increasingly significant concern involves patient medication adherence when these oral agents are self-administered at home (Given, 2009; Moore, 2007, World Health Organization, 2003). One challenge of oral chemotherapy is the rate of medication adherence to oral anticancer regimens, which varies widely from 16%–100% in adults (Ruddy, Mayer, & Partridge, 2009). Common patient problems related to oral chemotherapy adherence include improper administration, inadequate monitoring, and adverse side effects (Banning, 2009; Decker et al., 2009; Given, Spoelstra, & Grant, 2011; Goodin, 2007; Halfdanarson & Jatoi, 2010; Hartigan, 2003; Haynes, Ackloo, Sahota, McDonald, & Yao, 2008; Moore, 2007; Ruddy et al., 2009). Suboptimal or improper self-administration reduces treatment efficacy and increases toxicity (Hartigan, 2003; Maloney & Kagan, 2011; Partridge, Avorn, Wang, & Winer, 2002; Ruddy et al., 2009; Wood, 2012) and leads to treatment delays, changes in treatment, and premature death (Given et al., 2011). Patient self-administration of oral chemotherapy also increases the risk of errors and changes the way patients are monitored (Goodin, Aisner, Bartel, & Viele, 2007; Goodin et al., 2011). Older adults with cancer have additional adherence and safety risks because of age-related physical changes, comorbid conditions, polypharmacy, and drug interactions (Maloney & Kagan, 2011).

As reported by Weingart et al. (2008), significant patient safety concerns exist related to medication adherence, including safe handling (Goodin et al., 2011) and how patients manage missed doses and adverse events. To address these concerns, guidelines were published by the American Society of Clinical Oncology and the Oncology Nursing Society (Neuss et al., 2013; Weingart et al., 2012) to standardize the approach to oral chemotherapy administration by educating healthcare providers. Patients require similar education and support, including monitoring of medication procurement

(e.g., prior approval needs, associated costs) (Moore, 2007, 2010; Winkeljohn, 2010); knowledge of interactions with drugs (Goodin et al., 2007, 2011; Maloney & Kagan, 2011; Simchowitz et al., 2010), including nutritional supplements and herbs (Goodin, 2007); and monitoring and reporting of symptoms (Moore, 2010; Weingart et al., 2007, 2012; Wood, 2012). Symptomatology (e.g., fatigue, nausea/vomiting, diarrhea, dermatologic changes) associated with side effects in taking newer oral targeted therapies also affects a patient's adherence to a prescribed regimen. Several weeks may elapse between patient visits, when the appearance of toxicities most likely occurs, placing the responsibility of self-report of adverse effects on the patient, who may require dose modifications or interruptions (Goodin et al., 2007).

Studies of patient-oriented strategies to promote medication adherence (Banning, 2009; Decker et al., 2009; Haynes, Ackloo, Sahota, McDonald, & Yao, 2008) have used automated voice response systems (Decker et al., 2009), pill boxes (Haynes et al., 2008; Williams, Manias, & Walker, 2008), medication event monitoring system caps (Ruddy et al., 2009), and pill counts (Haynes et al., 2008). These strategies present problems and challenges, including accuracy, cost, and ease of use (Hartigan, 2003; Haynes et al., 2008; Partridge et al., 2002). Telephone follow-up is a strategy that has demonstrated improved patient satisfaction and knowledge of medication regimens (Berry et al., 2014; Courtney et al., 2009), functioning also as a reminder that supports adherence (Molassiotis, Lopez-Nahas, Chung, & Lam, 2003; Osterberg & Blaschke, 2005).

Systematic reviews of interventional studies for medication adherence support a standardized multimethod approach to medication management that involves tailored cognitive-educational approaches (Haynes et al., 2008) with psychosocial support strategies (Wens et al., 2008; Williams et al., 2008). Additional use of feedback (Demonceau et al., 2013) and monitoring by nurses (Haynes, McDonald, Garg, & Montague, 2002; McCauley, Bixby, & Naylor, 2006), including management of side effects (Kav et al., 2008) and use of a daily self-report diary (Oakley, Johnson, & Ream, 2010) and written information (Nicolson, Knapp, Raynor, & Spoor, 2009), can provide educational reinforcement. Other studies underscore similar needs for structured educational tools for systematic patient education (Given, 2009; Goodin et al., 2011; Maloney & Kagan, 2011; Simchowitz et al., 2010; Weingart et al., 2007, 2012; Wood, 2012) in the promotion of safety, optimal dosing, adherence, and detection and management of adverse events (Balkrishnan, 2005; Winkeljohn, 2007).

In response to the need for a standardized structured educational tool, a panel of oncology nurse experts created the Multinational Association of Supportive Care in Cancer (MASCC) Oral Agent Teaching Tool (MOATT) to help educate and monitor patients and caregivers. MOATT is a structured four-part systematic approach for oral cancer agent education involving key assessment questions, generic education discussion points, drug-specific education (e.g., frequency, storage, safety), and evaluation questions. In 2009, MASCC published the MOATT (Kav et al., 2010) for use by nurses with patients receiving oral anticancer agents, addressing a needed strategy to promote medication adherence and symptom management, including the reporting of related adverse side effects.

Minimal evidence exists for tested interventions to promote oral chemotherapy adherence. The need to implement new professional guidelines and improve clinical approach compelled the researchers to evaluate the implementation of a structured, nurse-led intervention using the MOATT to maximize patient knowledge and adherence related to self-administration of the oral agent erlotinib in patients with non-small cell lung cancer (NSCLC). No studies had yet evaluated the MOATT in clinical practice to promote medication adherence.

Methods

A descriptive feasibility study was conducted as an evidence-based practice (EBP) project at the Dana-Farber Cancer Institute (DFCI), a National Cancer Institute–designated ambulatory cancer center setting. The Dana-Farber/Harvard Cancer Center Institutional Review Board expedited and approved the study. The sample included eligible patients who were adults,

Session 1: Consent by nurses
- Review of the erlotinib handout and diary by nurses

Session 2: Education encounter
- By phone or in clinic
- Administer the Multinational Association for Supportive Care in Cancer Oral Agent Teaching Tool (MOATT) (parts 1–4).
- Document the encounter.
- Complete the feasibility form.

Session 3: Educational session (72-hour phone follow-up)
- Contact the participant.
- Administer parts 3–4 of the MOATT.
- Document the session.
- Complete the feasibility form.

Session 4: Educational session (first clinic visit after starting erlotinib)
- Collect and review the drug log.
- Have the participant complete the Morisky Medication Adherence Scale–8.
- Have the participant complete the Knowledge Rating Scale.
- Administer parts 3–4 of the MOATT.
- Document the encounter.
- Complete the feasibility form.

Figure 1. Intervention Schema

Table 1. Responses at Session 2 to Part 4 of the Multinational Association for Supportive Care in Cancer Oral Agent Teaching Tool (N = 29)

Question	Yes	No
Do you know that the agent is for lung cancer?	29	–
Do you know that the agent is taken by mouth?	29	–
Are you able to swallow pills or tablets?	28	1
Are you able to read the drug label information?	28	1
Are you able to open other medicine bottles or packages?	28	1
Have you taken other pills for your lung cancer?	29	–
Are you experiencing any symptoms that would affect your ability to keep down the pills (e.g., nausea, vomiting)?	1	28

English-speaking, diagnosed with NSCLC, and prescribed oral erlotinib (as monotherapy). The EBP project was developed by a collaborative team of DFCI nurses, including direct care nurses (DCNs), nurse practitioners, clinic and research nurses from the Thoracic Oncology Program, and DFCI nurse scientists.

Intervention

A description of the intervention schema, which includes four educational sessions, is illustrated in Figure 1. During session 1, when erlotinib was prescribed, the health practitioner provided initial oral and written education to the patient and discussed the option of participation in the current feasibility study. The DCN then met with the patient to discuss the study and obtain informed consent, provided an erlotinib drug log, and scheduled a 72-hour follow-up educational telephone encounter.

Session 2 was the first follow-up encounter prior to starting erlotinib and was determined to be a key time point for the DCN to contact patients who may have difficulty with prescription procurement or financial concerns related to the drug therapy. The DCN administered parts 1–4 of the MOATT (see Table 1). This tool included key assessment questions, generic education guidelines, discussion points, drug-specific education, and evaluation questions to assess and provide medication knowledge to participants (Kav et al., 2010).

Session 3, performed at an approximate 72-hour window after starting erlotinib, involved the DCN conducting the follow-up phone encounter to assess learning and identify any issues that the participant had related to erlotinib procurement or administration and possible side effects. Session 4 occurred at the participant's first scheduled clinic visit (usually about 2–3 weeks after starting therapy) or by phone. The adapted Morisky Medication Adherence Scale–8 (MMAS-8) (Morisky, Ang, Krousel Wood, & Ward, 2008; Morisky, Green, & Levine, 1986; Sommers, Miller, & Berry, 2012) and a demographic information form were administered along with parts 3–4 of the MOATT. This final study encounter occurred at the 6- to 8-week period of therapy in which the DCN collected and reviewed the erlotinib drug log with the participant and an adherence rate was calculated.

Sessions with the participant were documented in electronic nursing notes, according to standard nursing policies and procedures. Data regarding the feasibility (see Figure 2) of providing the DCN education, including the ability to contact or meet with the participant, time spent doing education, review of the diary, and symptoms and management, were recorded at each encounter. Unplanned patient-initiated contact by phone with the DCN was documented throughout the study.

Measures

The MMAS-8 was used as a self-report measure of medication-taking and adherence behavior. This measure originally was developed to collect data on self-reported adherence to antihypertensive medications (Morisky et al., 2008). The MMAS-8 consists of seven

Part 1: Key Assessment Questions
Assess the patient's knowledge of the treatment plan, current medications, and ability to obtain and take an oral cancer agent.
Feasibility Measures
- Ability to contact or meet with the participant
- Time spent on education and review
- Review of diary, symptoms, and management

Part 2: Generic Education
General patient teaching instructions applicable to all oral cancer agents (i.e., storage, handling, disposal, system to remember, and actions if problems)
Feasibility Measures
- Ability to contact or meet with the participant
- Time spent on education and review
- Review of diary, symptoms, and management

Part 3: Drug-Specific Information
Used to provide drug-specific information (i.e., dose and schedule, side effects, and potential interactions)
Feasibility Measures
- Ability to contact or meet with the participant
- Time spent on education and review
- Review of diary, symptoms, and management

Part 4: Evaluation Questions
Questions asked to ascertain understanding of the information provided
Feasibility Measures
- Completed evaluation questions

Figure 2. Multinational Association for Supportive Care in Cancer Oral Agent Teaching Tool Education Session Feasibility Measures

medication-taking behavior questions with "yes" or "no" responses. A point is given for each "no" answer, except for question 5, for which a "yes" response is given one point. Question 8 has a five-point Likert-type scale response about difficulty remembering to take medication from "never/rarely" (scored as 0) to "all the time" (scored as 5). The MMAS-8 version used in the current feasibility study previously was adapted, with permission for use with oral chemotherapy agents, by Sommers et al. (2012).

The total MMAS-8 score is a sum of the scores, with a possible range of scores from 0–8. A score of 6–8 indicates high adherence. Previous studies reported a reliability coefficient for the MMAS-8 of 0.83 (Morisky et al., 2008), with testing for concurrent validity (point biserial = 0.43, $p < 0.01$) (Morisky et al., 1986) and predictive validity ($r = 0.58$, $p < 0.01$) (Morisky et al., 1986) in adherence conducted with antihypertensive patients and correlated with blood pressure control. The reliability coefficient was 0.75 for the adapted MMAS version, as previously reported by Sommers et al. (2012). Participants also self-rated their perception of knowledge about erlotinib using a previously created Knowledge Rating Scale (KRS) (Fonteyn, Spenser, & Gross, 2008). The one-item scale is scored from 0–10, with 0 indicating no knowledge and 10 indicating the highest knowledge.

Findings

Of the 33 eligible patients, 3 declined to participate because of personal issues. Of the remaining 30 participants enrolled in the pilot study, 1 became ineligible to start the medication because of medical reasons, resulting in a total of 29 eligible participants who began the structured, nurse-led education. Two participants were not able to complete the study because of disease complications, leaving 27 participants who completed the entire four sessions of the study. Twenty-two of the 29 participants were women, 22 were Caucasian, and 17 had at least some college education.

Session 1 involved initial participant contact to review medication instructions, including the drug diary, prior to starting erlotinib. The average DCN time spent talking with the participant in session 1 was 25.21 minutes (SD = 7.72), with a range of 12–49 minutes. Additional help was noted for prescription procurement, including prior approval and co-pay assistance. For sessions 2–4, the average time spent on any one MOATT education session was 14.12 minutes (SD = 10.72). Times for individual sessions ranged from 3–50 minutes. Session 2 included MOATT parts 1–4, taking an average of 25 minutes (SD = 9.28), including part 4 MOATT evaluation questions about medication administration answered by all participants. Questions 1–6 revealed that all participants answered "yes" to items involving knowledge about and ability to take oral agents (i.e., swallowing by mouth), reading drug label information, and opening the medicine bottle or package. One participant answered "yes" to having a problem with a particular symptom that would affect ability to keep pills down. To reinforce education, parts 3 and 4 of the MOATT were administered again to participants in session 3, averaging 8.56 minutes (SD = 3.42) and in session 4, averaging 6.92 minutes (SD = 5.23). During the MOATT education sessions, noted challenges for the DCN that interfered with the ability to contact participants at preset appointment times by phone included having a busy clinic or frequent interruptions. During DCN contacts with some participants, side effects also were reported, including anxiety, gastrointestinal complaints (e.g., nausea, vomiting, diarrhea), and skin rash, warranting assessment and instruction for proper symptom management.

Knowledge and Adherence Measures

All 27 participants completing session 4 were seen in the clinic for the fourth and final educational session, completing the adapted MMAS-8 and KRS (see Table 2). Study reliability coefficient of the adapted MMAS-8 was 0.78. Eight participants completed the diary logs, eight did not keep the diary, two did not return the diary, and diary use was not documented for nine.

Feasibility outcomes included the 72-hour nurse follow-up call at session 3, during which a majority (n = 21) were contacted by telephone; six participants were unavailable because of work schedules. Of note, 66 patient-initiated telephone calls to the DCN for prescription and symptom management issues were documented. Twenty-eight calls for prescription procurement issues included refilling medication (n = 12), insurance coverage (n = 9), and paying for the drug (n = 7).

Table 2. End-of-Study Knowledge, Adherence, and Times Required for All MOATT Sessions

Variable	$\bar{X}$	SD	Range
KRS score	8.9	0.72	8–10
MMAS-8 score	7.12	1.01	6–8
MOATT time to conduct (minutes)	14.12	10.72	3–50
MOATT times to conduct (minutes)			
• Session 2 (n = 28)	25	9.28	15–50
• Session 3 (n = 25)	8.56	3.42	3–18
• Session 4 (n = 25)	6.92	5.23	3–26

KRS—Knowledge Rating Scale; MMAS–8—Morisky Medication Adherence Scale–8; MOATT—Multinational Association for Supportive Care in Cancer Oral Agent Teaching Tool

Note. The mean score on the KRS indicates a high level of knowledge regarding erlotinib. The mean score on the MMAS–8 indicates a high level of adherence to taking erlotinib as prescribed.

Knowledge Translation

Structured, nurse-led education may improve medication knowledge and adherence for patients with lung cancer on oral chemotherapy.

The Multinational Association for Supportive Care in Cancer Oral Agent Teaching Tool (MOATT) is a useful educational strategy for patients with cancer on oral chemotherapy.

Provision of nurse-led teaching and monitoring of oral chemotherapy in the outpatient setting warrants additional studies.

Symptom management issues involved reporting of side effects such as rash, nausea, and diarrhea and how to manage them using moisturizer agents, hydration, diet, and medications for antiemetic and antidiarrheal therapy. Participants reported a median of two side effects (range = 1–5).

Discussion

The feasibility of a structured, nurse-led intervention with patients on oral chemotherapy to enhance proper erlotinib knowledge and adherence was demonstrated during this EBP project. Of the original 30 enrolled participants, the majority completed the study. The 10% attrition rate was involuntary and occurred when one participant tested negative for epidermal growth factor receptor and did not start oral therapy and two participants were removed from oral therapy because of medical complications. Findings of high knowledge and adherence scores by the remaining participants (n = 27) supported the structured, nurse-led intervention. The MOATT, administered by DCNs to participants, also was feasible in regards to the time to administer educational sessions, which was lower than the previous estimation of 60 minutes by Kav et al. (2010). Similar to Weingart et al.'s (2011) findings on oral medication adherence, participants required assistance with drug handling, insurance coverage, prescription filling, paying for medication, and managing side effects.

Prior publications (Kav et al., 2010; Rittenberg, 2012) have promoted the MOATT as standard-of-care education, but randomized trials have yet to be published regarding the tool's efficacy. Additional testing of innovative multimethod strategies, including nurse-led instruction, medication prompting, and reinforcement, with monitoring of self-care behaviors and symptoms, has been recommended to increase medication adherence (Schneider, 2012; Schneider, Hess, & Gosselin, 2011; Weingart et al., 2012), improve management of symptoms (Moody & Jackowski, 2010), and optimize patient outcomes. A randomized trial by Schneider, Adams, and Goselin (2014) supports additional studies of a nurse-led, tailored standard education and coaching plan approach, which showed adherence benefits for some study participants.

Different methods for operationalizing and assessing adherence require additional investigation of the barriers, convenience, and cost issues associated with present devices and measures. Only 8 of 27 participants used the self-report diary log. Although a self-report diary is a simple subjective measure for monitoring medication adherence, the researchers found it to be the least feasible component of their intervention and monitoring measures. The adapted MMAS–8 questionnaire was an easily completed, self-report adherence measure, but the participants' responses may have had a recall bias. Objective, cost-effective measures of adherence, although out of scope for the current EBP project, are needed to enhance outcome evaluation.

The researchers' feasibility study findings cannot be generalized beyond similar samples or settings or to oral agents other than erlotinib. In addition, because of the single-arm design, the researchers cannot claim to have improved adherence with the intervention.

Implications for Nursing

Structured, nurse-led teaching for patients on oral chemotherapy is important for proper medication knowledge in self-administration and monitoring of side effects related to such therapies. Use of the MOATT in ambulatory cancer settings provides a valuable standardized educational tool for assessment, generic and specific medication education, and evaluation. Patient self-management of oral chemotherapy also requires nurses' support, using follow-up evaluation by telephone or during clinic visits after initial therapy starts. Another implication includes the patients' need for assistance with insurance coverage and prescription filling, as reported in previous findings by Weingart et al. (2011). Because pharmacy plays a role in medication dispensing and dosing instruction, the nurse's role includes reinforcement of education (particularly in the first 6–8 weeks) while monitoring for side effects that require support through symptom management using physiological and psychosocial interventions.

Conclusions

The current feasibility pilot study was one of the first oncology-based projects in an oncology ambulatory setting that implemented structured, nurse-led education using the MOATT with follow-up nurse monitoring and supportive care. A structured, nurse-led intervention resulted in high scores for patient knowledge and

adherence, suggesting that nurse involvement, along with use of the MOATT, with follow-up monitoring was very beneficial to these patients. The participation time required for each educational session was reasonable and supported the feasibility of the current pilot project. The overall findings from the current pilot study support wider implementation and evaluation with other cancer diagnoses for which oral chemotherapy is prescribed.

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