# Title: Developing preliminary steps in a pharmacist communication – patient outcome pathway

## Abstract

*Background*

Non-adherence to medications has been associated with poor health outcomes and increased healthcare costs. The literature describes pharmacists as key healthcare professionals to identify and address non-adherence issues, but does not explain how and why effective pharmacist-patient communication affects patients' medication adherence. Previously published pathways used in linking effective physician-patient communication to patient outcomes are proposed for the pharmacist-patient communication context.

*Objectives*

To develop preliminary steps in a pharmacist communication-patient outcome pathway adapted from a physician communication pathway, and enable research to advance in this specialist area.

*Methods*

This longitudinal descriptive study took place in a large quaternary hospital involving hospital pharmacists and patients. Patients' assessment of pharmacist communication behaviours and patient satisfaction occurred after their pharmacist-patient consultation. Medication taking behaviour questionnaires were administered before the consultation and again, four weeks post-discharge. Developing a preliminary pathway based on physician communication pathways involved two steps and investigated associations between: 1) Patient-reported effective communication as per Communication Accommodation Theory:

CAT) and satisfaction, and 2) Patient-reported pharmacist communication, satisfaction and medication taking behaviour.

*Results*

Forty-eight patients participated. For Step 1, almost all patient-reported pharmacist communication behaviours were positively correlated with patient satisfaction statements. Strong associations between CAT-related pharmacist communication behaviours and patient satisfaction highlighted pharmacist behaviours are important to patients and necessary for effective conversations to take place. In Step 2, fewer correlations occurred with medication taking behaviour indices and pharmacist communication behaviours and patient satisfaction.

*Conclusions*

This study demonstrated how a preliminary pharmacist communication – patient outcome pathway could be successfully adapted from existing physician communication pathways. These pathways provide an initial platform on which future pharmacist communication-patient outcome research can be built.

**Keywords**

communication-outcome pathway hospital pharmacist communication patient satisfaction

medication adherence Communication Accommodation Theory (CAT)

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## Introduction

Non-adherence to medications results in poor health outcomes for patients and increased costs to healthcare systems.<1, 2> Patients' non-adherence to medications varies considerably depending on the condition treated. For example, patient medication nonadherence rates range from 35% to 69% in type 2 diabetes, 40-70% in asthma and 25-65% in hypertension.<3-5> Multiple determinants for non-adherence include socioeconomic-related factors, health care team/health system-related factors, condition-related factors, treatment-related factors, and patient-related factors.<4> Determinants attributed to healthcare providers such as good relationships and effective communication with patients have been found to facilitate medication adherence for the management of pain, diabetes, epilepsy, HIV/AIDS, tuberculosis, hypertension and tobacco cessation.<4>

Pharmacists have been identified as key healthcare professionals in identifying and addressing non-adherence issues.<6, 7> While much has been published about the pharmacist's role in improving medication adherence <4, 8-11>, there is scant information about how and why effective pharmacist-patient communication might affect patients' medication adherence. This is a substantial gap in understanding the role pharmacists play in patients' adherence to their medications, particularly over time and once a patient leaves the inpatient setting.

Conversely, numerous empirical studies have investigated the effect of good physician-patient relationships and effective communication on clinical outcomes with a positive relationship between effective physician communication skills and patient adherence to treatment. <12-15> For example, a meta-analysis of 106 studies correlated physician-patient communication with patient adherence as well as 21 experimental intervention studies

evaluating the effect of physician communication training on patient adherence. Researchers reported that the odds of a patient being adherent to their treatment was 2.16 times better if their physician communicated well, and 1.62 times better if their physician had received communication training compared to those patients whose physicians had not had the communication skills training.<13>

However, there are inconsistent findings within the medical literature where attributes of effective physician communication skills have not been associated with treatment adherence and other patient outcomes.<16>

Physician-patient communication research has been criticised as lacking sufficient understanding of which aspects of physician-patient communication contributes to which health outcome.<17> Furthermore, healthcare provider-patient communication research fails to suggest pathways and processes to explain how effective communication could be associated with positive patient outcomes. Street et. al. posits that these links between physician-patient communication effectiveness and patient outcomes are often complex. <17> While positive communication exchanges may directly result in desirable health outcomes for patients, these interactions often follow indirect paths leading first to proximal outcomes (E.g. rapport building, patient satisfaction) then to intermediate outcomes (E.g. self-care skills, treatment adherence) before achieving health outcomes (E.g. cure, emotional well-being) (Figure 1).<17>

**Figure 1. Pathways from pharmacist-patient communication to health outcomes**

Pharmacist communication-patient outcome research is relatively new and consequently under-studied in comparison to the work completed by physician-patient communication researchers. Given the complexity of communication-health outcome research, it is important

to use the lessons learned from the physician communication studies and develop pharmacist communication to patient outcome platforms that allow the clear delineation of which measured communication behaviours are linked to which patient outcomes.

This research intends to demonstrate how such a preliminary pathway can be adapted from physician communication described by Street. <17> Relationships will be explored between effective pharmacist-patient exchanges, patient satisfaction and patients' medication taking behaviour, and these will be conducted in multiple steps. To begin, relational aspects between communication and medication adherence will be studied through a pathway adapted from previous research (as depicted in Figure 1) to fit the pharmacist-patient context.<17> Relationships between proximal outcomes such as effectively used communication strategies and patient satisfaction will be studied. Then possible associations with these proximal outcomes and the intermediate outcome of adherence to treatment will be explored (Figure 2).

**Figure 2. Exploring relationships between effective communication, patient satisfaction and medication taking behaviour**

This study invoked Communication Accommodation Theory (CAT), as the theoretical framework used in all aspects of this research (I.e. design, data collection, analysis and presentation of results and discussion). CAT is a widely used framework in health communication research <18-22>, to help explain the emotional, behavioural and motivational processes underlying communication exchanges.<23> The "CAT strategies used effectively" within Figure 2 are the five strategies measured to establish the presence or lack of effective communication in patient and health professional interactions.<24-26> These

include: approximation (matching another speaker's speech rate, volume, accent/dialect)<27>, interpretability (using easily understood language and terms)<24>, emotional expression (appropriately responding to other speaker's emotional needs)<26>, discourse management (engaging and maintaining conversations)<28>, and interpersonal control (empowering/promoting equality between speakers).<25, 29, 30> CAT describes communication as being either accommodative (adjustments made to bring speakers closer linguistically) or non-accommodative (behaviour that creates barriers or linguistic distance between speakers).<24> In the pharmacist-patient communication context, accommodation takes place when pharmacists slow down their speech to match that of patients', use medical terms understood by patients, and ask open-ended questions to enage patients in conversations about their medications. Conversely, non-accommodation occurs when pharmacists do not meet patients' conversational needs. For example, this might happen when pharmacists relay information in a one-way direction or frequently interupt patients, not allowing them to ask questions about their medications.

This research is intended to be exploratory. Data were collected as part of earlier research which focused on qualitative investigation of communication effectiveness between hospital pharmacists and patients during medication counselling.<31> Therefore, this study was not designed or powered to detect differences in medication taking behaviours over time. Rather, this novel study seeks to lay the foundation for the development of preliminary pharmacist communication-patient outcome pathways that can direct future research. Importantly this study is longitudinal and follows patients over a one-month period.

## Aim of the Study

The study's objective is to develop preliminary steps in a pharmacist communication-patient outcome pathway by adapting a physician communication pathway to the pharmacist-patient communication context. To achieve this objective, the following steps were undertaken to show:

- How effective pharmacist communication (using CAT) and patient satisfaction are associated (Step 1)
- How patients' medication taking behaviour is associated with patient-reported effective communication and satisfaction? (Step 2)

## Ethics Approval

Research ethics approval was received from XXX (Hospital) Human Research Ethics Committee (HREC/15/QRBW/433) and from the School of Pharmacy, XXX (University) Ethics Committee (2015/13). All participants provided written informed consent.

## Methods

### Study design

This was a descriptive study that used quantitative methods to address the study's objective involving two steps: (1) measuring the relationship of CAT-related pharmacist communication behaviours with patient satisfaction statements from semi-structured interviews; (2) correlating pharmacist communication behaviours and patient satisfaction with medication taking behaviour questionnaire results. The second step also included investigating changes in patients' beliefs about their medications and their medication adherence over time.

### Recruitment and Data Collection

Data were collected in a 1000 bed teaching hospital as part of an overarching research project which focused on qualitative investigation of communication effectiveness between hospital pharmacists and patients during medication counselling. Details on the method and the results reporting communication effectiveness though invoking CAT have been reported elsewhere..<31> This current study focusses on data on patient assessment of pharmacist communication, patient satisfaction and association with medication taking behaviour. Consented patients were administered two medication taking behaviour questionnaires, Beliefs about Medicines Questionnaire (BMQ)<32> and the 8-point Morisky Medication Adherence Scale (MMAS-8).<33, 34> Then, audio recorded pharmacist-patient medication consultations were conducted, and immediately followed by semi-structured interviews held separately with pharmacists and patients to gain each participants' perspective. Participants responded to a series of statements, based on CAT strategies, about their opinions about their shared conversation by indicating their level of agreement using a 7-point Likert scale. One statement was reverse worded. The principal investigator conducted interviews and answered any questions participants had about any of the statements.

Four weeks after patients left hospital, the BMQ and MMAS-8 were administered again by telephone. This time frame was chosen to allow sufficient time to elapse after the initial pharmacist-patient interaction and not to be too excessive as to challenge patients' recall of their experience.

**Semi-structured interview guide development**

The interview guide consisted of 10 statements based on CAT strategies that reflected aspects of pharmacist-patient communication and three statements about participants' overall satisfaction. Face and content validity of the statements was provided by the three

pharmacists on the research team while statements' relevance to CAT strategies was verified by the psychologist on the team. Cronbach alpha reliability testing was conducted to provide assurance of internal consistency within the ten CAT based statements.<36> Cronbach alpha value calculated for the unidimensional 10 CAT statement scale was .75 for patients, above the acceptable .7 value. <36> A Cronbach alpha of .68 was calculated for the three patient satisfaction statements. This value was not unexpected as only three items were included in the scale. <37> However, the mean inter-item correlation which also analyzes internal consistency was calculated as 0.4 for these patient satisfaction statements and is within acceptable ranges.<37>

**Medication taking behaviour questionnaires**

The BMQ is a validated instrument that assesses patients' beliefs about the necessity of prescribed medication and their concerns about the potential dangers or disruptive effects of their medications.<32> Patients with strong beliefs about the value of their medications and few concerns about their medicines are more likely to be adherent to their medications.<32>

The MMAS-8 medication adherence tool, composed of eight questions, requires patients to reflect on their medication taking behaviours. Scores of eight are indicative of high adherence, 6-8 reflects moderate adherence while scores less than 6 are considered to be low adherence.<33, 34 > The MMAS-8 was chosen because it is a convenient, easy-to-use, validated research tool that has been applied worldwide in a variety of health conditions.<34,35, 38-41>

**Data Analysis**

BMQ, MMAS-8 and semi-structured interview statements responses were recorded in a Microsoft Excel database. All data were analysed using SPSS (Version 25.0).<42> A *p*-value

of less than 0.05 was considered statistically significant. Because the data were not normally distributed, non-parametric tests were used to analyse the data.

A Spearman's correlation was used to test both the relationship between CAT behavioural statements and patient satisfaction statements, and the associations between CAT and patient satisfaction statements with the four-week BMQ and MMAS-8 results. The four-week post discharge scores were chosen rather than the baseline, because this assessment occurred after the pharmacist-patient conversation and would better reflect any effects of the exchange.

BMQ and MMAS-8 scores for questionnaires administered to patients prior to the pharmacist-patient conversation were compared to the four-week post discharge scores using Wilcoxon Signed Rank test to detect changes in scores over time. The effect size (r) for any significant differences was calculated by dividing the test statistic (Z) by the square root of the number of observations.<37> Therefore, based on Cohen (1988) criteria, 0.1 = small effect size, 0.3 = medium effect size, and 0.5 = large effect size.<43>

**Results**

Twelve pharmacists engaged four separate patients each for a total of 48 medication counselling interactions; however, not all 48 patients who consented to be in the study completed all parts of the study (Figure 3). The majority (83%) of pharmacists who took part in the study were women while around 50% were under 30 years old and had worked for less than 10 years as a pharmacist. Participating patients were mostly male (56%) and over 60 years of age. Patients from both inpatient areas (cardiology, emergency, geriatrics, general medicine, nephrology, neurology, oncology, surgery) and outpatient clinics (heart failure, infectious diseases, renal clinic) were included.

**Figure 3. Patient enrolment and participation**

## Step 1 - Relationship between patients' assessment of pharmacists' communication behaviours and patients' satisfaction

Overall, patients indicated strong agreement (>80%) for pharmacists demonstrating the communication behaviours described in each of the ten statements. Patients' level of agreement to ten statements assessing pharmacists' communication behaviours and their relationship to three patient satisfaction statements are displayed in Table 1.

**Table 1. Relationship between patients' assessments of pharmacists' communication behaviours & patients' satisfaction**

## Step 2- Relationship between patients' assessment of pharmacists' CAT behaviours, their level of satisfaction and medication taking behaviour indices (BMQ & MMAS-8 Scores)

Almost all correlations with statistical significance occurred with the BMQ post necessity score in which five pharmacists' communication behaviours and two patient satisfaction statements were found to be positively correlated (Table 2).

**Table 2. Relationship between patients' assessment of pharmacists' communication behaviours, satisfaction & BMQ and MMAS-8**

## Changes in BMQ and MMAS-8 scores over time

Differences between patients' BMQ and MMAS-8 scores measured prior to their conversation with a pharmacist about their medications and again four weeks after the patients had left the hospital are shown in Table 3.

**Table 3. BMQ* and MMAS-8* patients' scores at two points in time**

The distribution of MMAS-8 scores for the first and second questionnaires is shown in Table 4.

**Table 4. Distribution of MMAS-8 scores at two points in time**

## Discussion

This novel, longitudinal, exploratory study showed how the theoretical communication-patient outcome pathways developed for physicians could be adapted to the pharmacist-patient communication context. This study focussed on two steps in the original pathway (Figure 1) to demonstrate how effective communication (using CAT) and patient satisfaction are associated (Step 1) and how patients' medication taking behaviour is associated with patient reported effective communication and satisfaction (Step 2). The most impressive results were the high number of positive correlations between patient-reported pharmacist communication behaviours and patients' level of satisfaction. This highlights the pharmacist communication behaviours that are of particular importance to patients, and therefore, necessary for effective conversations. In addition, some promising trends were observed in correlations between medication taking behaviours and pharmacist communication behaviours/patient satisfaction. The strength of this study is that it has mapped pathways for conducting future research that link pharmacist-patient communication to patient outcomes. This is an important step to facilitate rigorous pharmacist

communication research that indicates how and where associations between communication and patient outcomes occur, and to avoid the pitfalls encountered by earlier physician communication researchers who did not clearly delineate these relationships. <17>

This process of adapting a physician communication pathway for pharmacist communication research revealed some important and interesting findings. Step 1 of this investigation mirrored the relationships between the "Communication Function" and the "Proximal Outcomes" as well as the interplay of communication behaviours and patient satisfaction found within "Proximal Outcomes" of Figure 1 adapted from Street et al. <17> The first step showed that nearly all patient-assessed pharmacist communication behaviours were positively correlated with all three patient satisfaction statements. This finding implied that the more patients experienced these pharmacist communication behaviours, the higher their reported levels of satisfaction with the pharmacist-patient exchanges. However, there were two exceptions noted for the communication behaviours statements. Statement 2 (Table 1), "The pharmacist used medical terms I could understand", was the only statement that had been reverse-worded statement in the patient's semi-structured interview. It is possible that this statement (being reverse-worded) may have been confusing to some patients resulting in their incorrect interpretation and scoring of the pharmacist's behaviour. Only one patient satisfaction statement, "This was an effective conversation with the pharmacist" was positively correlated with statement 10 which described the pharmacist as encouraging the patient to take responsibility for managing their health. It is unclear why a positive correlation was not observed for this pharmacist behaviour statement and the two other patient satisfaction statements. However, lower scores assigned to pharmacists' communication behaviour statements by patients did not necessarily mean that pharmacists

were nonaccommodative to patient's conversational needs. Instead, it sometimes meant that the pharmacists' behaviour was not observed by the patient in their interaction.

Several pharmacist communication behaviours were strongly correlated with the patient satisfaction statements. Of note, the pharmacist behaviour statements 1 and 3 to 9 (Table 1) are strongly correlated with all three patient satisfaction statements. Other researchers have found positive associations with similar communication behaviours and patient satisfaction. Pharmacists from the UK trained in a cognitive behavioural therapy framework provided medication consults to patients on an inpatient mental health ward. Patients expressed high levels of satisfaction with having their questions answered in a way they could understand and being treated with respect and dignity.<44> Patients surveyed at a US immunisation clinic after receiving counselling and an immunisation from a pharmacist expressed satisfaction in having the "pharmacist explain things to me in a way that I can understand" and "pharmacist spends as much time as is needed with me".<45> Australian researchers eliciting patient's assessment of their experience and level of satisfaction with prescribing pharmacists in a surgical pre-admission clinic reported similar relationships between a number of assessment statements and patient satisfaction as observed in this study. These included "explained clearly", "provided relevant information", "listened", "answered questions in a way easily understood", and "understood medication concerns expressed". <46>

Step 2 of this study explored the link between "Proximal" and "Intermediate" outcomes (Figure 1) by investigating whether a relationship between pharmacists' communication behaviour or patients' level of satisfaction exists with patients' medication taking behaviours existed.<17> The positively and statistically significant correlations between pharmacist

communication behaviours and patients' satisfaction occurred mainly with the BMQ post necessity score. This positive correlation is understandable as patients who have experienced a pharmacist-patient interaction where the pharmacist provided well-explained information, at a pace that allowed patients enough time to ask questions and addressed medication issues, would likely appreciate the need for their medication and its benefits to health and wellbeing. Patients who felt a pharmacist was empathetic and provided reassurance in response to their concerns about their medications may have stronger beliefs that their medications are beneficial to them. Therefore, it is not surprising that there were strong positive correlations between the overall satisfaction statements, "I was satisfied with my experience I had with the pharmacist", "The pharmacist did a good job helping me understand my medicines" and the necessity score. However, it is unknown why the same associations were not observed for the satisfaction statement, "This was an effective conversation with the pharmacist."

There was only one negative statistically significantly correlation between statement 2, "The pharmacist used medical terms I could understand." and the post concern score. This indicates that the more patients experienced pharmacists using layman's terms rather than medical terminology, the less patients expressed concerns about the harmful effects of their medications.

No statistically significant associations were observed with any pharmacist behaviour statements, patient satisfaction and post medication adherence (MMAS-8) scores. In addition, significant differences in medication adherence indices measured at two time-points was observed only for the MMAS-8 scores. For all other medication adherence indices, differences measured between the first and second time points were small. In this study population, many patients had been identified as moderately and highly adherent, and

therefore there was little or no room for a change to occur in their adherence scores. Other researchers have reported how initial scores already reflecting higher levels of medication adherence make it difficult to see any significant changes in medication taking behaviour. <34, 47>

There are potential limitations to this study. Patients may have provided socially desirable responses when they assessed pharmacists' communication behaviours and indicated their levels of satisfaction. Although patient interviews were held immediately after their conversation with the pharmacist, it is possible that they may not recall specific details about their interaction. These biases may have also occurred at the four-week follow up. This research was conducted at a single public hospital, and therefore the results might not be transferable to all specialty areas at other hospitals or to rural or private hospitals. Patient outcomes such as medication adherence are influenced by multiple factors in addition to effective health professional-patient relationships and communication. <4> Therefore, the pharmacist communication – patient outcome pathway explored in this study helps to explain how different aspects of communication may be associated with a patient outcome such as medication adherence, but the links do not imply causality. Although the medication taking behaviour questionnaires used in this study have been validated in a range of medical conditions and cultural contexts, using additional measures of medication adherence such as prescription fills could have strengthened the methodology of this study. Future research will address these issues.

In summary, a physician-patient communication outcome pathway has been mapped to the pharmacist-patient communication context. By doing so, this research introduces a valuable foundation for future work by providing some preliminary process mapping of the

pharmacist-patient communication interaction to proximal and intermediate outcomes.<17> For example, next steps in this research might include a randomised controlled trial including sufficient baseline numbers of low adherent patients subjected to multiple communication interventions and followed over time

By adapting an outcome pathway from the literature, a framework has been created to conduct exploratory research investigating the relationship between effective pharmacist-patient exchanges and patients' medication taking behaviour. This research represents an important preliminary step in establishing links between pharmacist-patient communication and patient outcomes.

**Acknowledgements**

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**Footnotes**

The following footnote is required for any figure or table that references MMAS-8 (Figure 3 and Tables 2-4):

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**Table 1. Relationship between patients' assessments of pharmacists' communication behaviours & patients' satisfaction**

| Pharmacist communication behaviour statement | Associated CAT strategy | Patient % agreement with pharmacist behaviour (n=48) | Spearman's Rank Correlation with Patient Satisfaction statements | | |
|---|---|---|---|---|---|
| | | | The pharmacist did a good job helping me understand my medicines. | I was satisfied with my experience I had with the pharmacist. | This was an effective conversation with the pharmacist. (I got what I needed.) |
| 1. The pharmacist spoke clearly - so I could understand what they were saying. | Approximation | 100% | .361* | .371** | .388** |
| 2. The pharmacist used medical terms I could understand. | Interpretability | 88% | -.131 | .049 | -.031 |
| 3. The pharmacist explained how my medication works in a way I could easily understand. | interpretability | 100% | .369* | .333* | .601** |
| 4. The pharmacist gave me enough time to think about the medication information given to me so that I could ask any questions I had. | Discourse management | 96% | .196 | .306* | .498** |
| 5. The pharmacist paid attention and listened to my concerns about my medications. | Discourse management | 100% | .501** | .328* | .431** |
| 6. The pharmacist allowed me to interrupt to ask questions. | Interpersonal control | 98% | .357* | .334* | .457** |
| 7. I felt like the pharmacist thought my worries and questions about my medicines were important. | Emotional expression | 98% | .597** | .443** | .383** |
| 8. The pharmacist spoke to me in a respectful and courteous manner. | Emotional expression | 100% | .432** | .592** | .395** |
| 9. The pharmacist encouraged me to talk to my doctor and/or community pharmacist about different medication options available to me. | Interpersonal control | 87% | .383* | .389** | .318* |
| 10. The pharmacist encouraged me to take responsibility for managing my health. | Interpersonal control | 87% | .143 | .117 | .303* |

**Note:** Agree includes the total of Agree plus Strongly Agree responses or in the case of reverse worded statements, Disagree plus Strongly Disagree responses;
**Correlation is significant at the p<0.01 level (two-tailed). *Correlation is significant at the p<0.05 level (two-tailed).

**Table 2. Relationship between patients' assessment of pharmacists' communication behaviours, satisfaction & BMQ and MMAS-8**

| | Spearman's Rank Correlation with BMQ |
|---|---|

| Pharmacist communication behaviour (1-10) & patient satisfaction statements (11-13) | Patient % agreement with statements (n=48) | & MMAS-8 Post Necessity Score (BMQ) (n=47) | Post Concern Score (BMQ) (n=47) | Post MMAS-8 Score (n=46) |
|---|---|---|---|---|
| 1. The pharmacist spoke clearly - so I could understand what they were saying. | 100% | .272 | .008 | -.071 |
| 2. The pharmacist used medical terms I could understand. | 88% | .226 | -.360* | .042 |
| 3. The pharmacist explained how my medication works in a way I could easily understand | 100% | .332* | -.028 | -.185 |
| 4. The pharmacist gave me enough time to think about the medication information given to me so that I could ask any questions I had. | 96% | .427** | -.042 | -.062 |
| 5. The pharmacist paid attention and listened to my concerns about my medications. | 100% | .251 | .010 | -.065 |
| 6. The pharmacist allowed me to interrupt to ask questions. | 98% | .143 | -.052 | -.103 |
| 7. I felt like the pharmacist thought my worries and questions about my medicines were important. | 98% | .296* | .087 | -.116 |
| 8. The pharmacist spoke to me in a respectful and courteous manner. | 100% | .328* | -.055 | -.082 |
| 9. The pharmacist encouraged me to talk to my doctor and/or community pharmacist about different medication options available to me. | 87% | .388** | .117 | -.225 |
| 10. The pharmacist encouraged me to take responsibility for managing my health. | 87% | .271 | -0.53 | -.036 |
| 11. The pharmacist did a good job helping me understand my medicines. | 98% | .326* | 0.134 | -.072 |
| 12. I was satisfied with my experience I had with the pharmacist. | 100% | .381** | -.002 | -.062 |
| 13. This was an effective conversation with the pharmacist. | 98% | .167 | -.039 | -.059 |

**Note:** Agree includes the total of Agree plus Strongly Agree responses or in the case of reverse worded statements, Disagree plus Strongly Disagree responses;
**Correlation is significant at the p<0.01 level (two-tailed). *Correlation is significant at the p<0.05 level (two-tailed).

*(Footnote required for any reference to MMAS-8)*

**Table 3. BMQ* and MMAS-8* patients' scores at two points in time**

| **BMQ & MMAS-8 Results** | **1st Questionnaire** Median (Range) (BMQ n=48 & MMAS-8 n=45) | **2nd Questionnaire** Median (Range) (BMQ n=47; MMAS-8 n=46) | **Wilcoxon Signed Rank Test** *Z value & p* value & r value |
|---|---|---|---|
| **BMQ** | | | |
| Necessity score | 21 (11-25) | 21 (12-25) | Z = 0, p = 1.0 |
| Concern score | 12 (5-22) | 13 (5-22) | Z = 1.690, p = .091 |
| **MMAS-8** | 6.75 (0.5 – 8) | 7.00 (1-8) | Z = 2.298, p = 0.022; r = 0.248 |

**Note:** First questionnaire was administered before patient's conversation with pharmacist, and second questionnaire took place four weeks after patient left hospital.
*BMQ – Beliefs about Medicines Questionnaire
*MMAS-8 – 8-point Morisky Medication Adherence Scale

*(Footnote required for any reference to MMAS-8)*

**Table 4. Distribution of MMAS-8 scores at two points in time**

| **MMAS-8 Adherence Level** | **1st Questionnaire*** Number (%) | **2nd Questionnaire**** Number (%) |
|---|---|---|
| Low Adherence (MMAS-8 Scores <6) | 18 (40%) | 7 (15%) |
| Moderate Adherence (MMAS-8 Scores 6 to <8) | 18 (40%) | 20 (44%) |
| High Adherence (MMAS-8 Scores >8) | 9 (20%) | 19 (41%) |

*1st Questionnaire (n=45); ** 2nd Questionnaire (n=46)

*(Footnote required for any reference to MMAS-8)*