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EVALUATION OF QUALITY OF PRESCRIPTION USING PRESCRIPTION QUALITY INDEX TOOL – A COMPARITIVE STUDY IN CARDIOLOGY, NEPHROLOGY & ONCOLOGY DEPARTMENTS IN TERTIARY CARE HOSPITAL

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ABSTRACT:

The aims were to develop a new Prescription Quality Index (PQI) for the measurement of prescription quality in chronic diseases. The PQI were developed based on 3 separate surveys and one pilot study. Criteria were developed based on literature search, discussions and brainstorming sessions. Validity of the criteria was examined using modified Delphi method. Pre testing was performed on 18 patients suffering from chronic diseases. The modified version was then subjected to reviews by pharmacists in a survey. The score based PQI with 22 criteria was then tested in 150 patients in Cardiology, Nephrology and Oncology departments. Results were analyzed using SPSS version 12.0.1. Exploratory principal components analysis reveals that, multiple factors contributing to Prescription Quality Index. Cronbach's α for the entire 22 criteria was 0.60. The reliability was good to moderate stability (intraclass correlation coefficient 0.76 and 0.52 respectively). The PQI was significantly and negatively correlated with age (correlation coefficient – 0.34, $P < 0.001$) Number of drugs in prescription (correlation coefficient – 0.51, $P< 0.001$) and number of chronic diseases/ conditions (correlation coefficient – 0.35, $P< 0.001$). The PQI is a promising new tool for measuring prescription quality. It has been shown that the PQI is a valid, reliable and responsive tool to measure quality of prescription in chronic diseases.

KEYWORDS: Chronic diseases, Prescription quality index, Cardiology, Nephrology, Oncology.

INTRODUCTION:

Prescribing practice is far away from ideal prescription. Poor quality of prescribing is a matter of concern at all healthcare levels. This indicates a need for pharmacy and medical educators to further emphasize the importance of writing clear and complete prescriptions. It also calls for the implementation of educational program and monitoring specific program to bring more awareness to all concerned so as to minimize the occurrence of prescribing errors and improve quality of prescribing. For monitoring, the prescription audit is a commonly used method. Different types of drug use studies evaluating the quality of prescribing are reported from all over the world. However, one of the great limitations in measuring the quality of prescription is lack of a method that is sufficiently valid and reliable to allow systematic use in clinical setting.[1]

There is a need for the development of a new tool for Prescription Quality Index (PQI) which has to be standardized and validated. The present study focuses on evaluation of quality of prescription using Prescription Quality Index (PQI) tool which has 22 criteria. Prescription order is an important transaction between the physician and the patient. It is an order for a scientific medication for a person at a particular time.[2] It brings into focus the diagnostic acumen and therapeutic proficiency of the physician with instructions for palliation or restoration of the patient's health.[3] Prescription is a written document that engages the medical and legal responsibility not only of the physician but of all those subsequently involved in its execution.[4] Prescription writing used to be an art as well as a science. Unfortunately, times have changed. More often than not, we find incomplete and illegal prescriptions being handed over to patients, and, more unfortunately, honored at pharmacies. This has resulted in a disturbing trend of putting the patients' safety at risk; and there is an urgent need to put things right. Nowadays the prescribing pattern is changing and it has become just an indication of medicine with some instructions of doses without considering its rationality.[2]

"The PQI was developed with a strong structural foundation and claims to capture clinical, clerical and legal requirements of a prescription". [5] Author also stated that "The PQI is claimed to capture the multidimensional criteria of prescription quality" and "PQI incorporates the concept of rational drug therapy, evidence-based approach and other criteria required for prescription quality".[5] Furthermore, PQI was also able to discriminate between the proportion of good prescriptions and prescriptions with problem.[5] The developers of this tool

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

believe that the use of this tool will enable the quality of prescription to be measured, analyzed and monitored. Therefore, the benefits of interventions can be examined for further improvement in patient care.[5]

Various measures which have been developed to evaluate prescribing quality, include explicit indicators such as Beers criteria,[6,7] and other such as the Medication Appropriateness Index (MAI) developed by Hanlon et al.[5,8] at Duke University Medical Centre (Durham, NC, USA) to evaluate the appropriateness of medication use in individual patients,[5] WHO prescribing indicators,[9] and multidimensional indicators such as comprehensive medication review with regard to indications for drug use and active medical conditions.[10] The Swedish National Board of Health and Welfare explicit indicators for evaluation of drug therapy among elderly patients,[11] the improved prescribing in the elderly tool (IPET), [12] and the PRISCUS List by Holt S et al.[13] are some other indicators. However, there is no universal definition of medication appropriateness, because quality may be assessed in different ways, depending on data available (prescription database vs. individual assessments), setting, and comprehensiveness. Beers' criteria include explicit (criterion-based) or implicit (judgment-based) prescribing indicators for evaluating prescribing practice for elderly patients. More recently, the STOPP (Screening Tool of Older Persons' potentially inappropriate Prescriptions) criteria were validated in a European setting,[14] and the START (Screening Tool to Alert doctors to the Right Treatment) criteria, which highlight under prescription or omission of clinically indicated, evidence based medications,[12] for evaluating quality of prescribing to elderly were introduced but they are not specifically designed to address the multiple problems associated with prescription quality.[5] Most of measures are based on expert judgment of practitioners or consensus,[15-17] without information on the psychometric properties of the instruments.[5] None of these tools covers all the dimensions of appropriate prescribing. The tool which would evaluate all aspects of prescription right from the selection of the drug to complete prescribing instructions would be most appropriate.

MATERIALS & METHODS:

Approval of the Protocol by IEC:

The proposed study protocol was submitted to the institutional ethics committee (IEC) of Nirmala College of Pharmacy, Mangalagiri, Guntur (Dt), Andhra Pradesh. The IEC approved the protocol on Evaluation of Quality of prescription using Prescription Quality Index Tool- A Comparitive study in Cardiology, Nephrology & Oncology Departments in a tertiary care hospital.

Study site: The study was conducted at a tertiary care hospital that is Manipal Super Specialty Hospital, Vijayawada, Andhra Pradesh state of India. Cases were collected and evaluated using the Prescription Quality Index (PQI) tool.

Study design: A cross-sectional study prospective observational study.

Study Duration: The study was conducted from August 2019 to March 2020-spread over 7months.

Study Population: Patients were attending the inpatient department (IPD) of selected three departments which are Cardiology, Nephrology & Oncology. Prescriptions of these patients were collected and recorded as per study criteria.

Study criteria: The following inclusion criteria were considered for selecting suitable patients for the study.

Inclusion criteria: (For chronic illnesses)

Patients of either sex and of all ages suffering from following chronic illnesses of respective departments like Cardiology, Nephrology, and Oncology.

Exclusion Criteria: Patients who are not diagnosing the respective departments Cardiology, Nephrology, and Oncology were excluded from the study.

Our study was mainly divided into three phases:

1. Preparation of PQI tool
2. Patient data collection for prescription analysis
3. Analyzing or Validating the Quality of Prescription

PQI TOOL:

S. no	Criteria	Score	Min Score
1.	Is there an indication for the drug? Comments:	Not indicated Weakly indicated Indicated No information	0 2 4 9

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

2.	Is the dosage correct? Comments:	Incorrect Marginally correct Correct No information	0 2 4 9
3.	Is the medication effective for the condition? Comments:	Ineffective Slightly effective Effective No information	0 1 2 9
4.	Is the usage the drug for the indication supported by evidence? Comments:	No evidence Weak evidence Strong evidence No information	0 1 2 9
5.	Are the directions for administration correct? Comments:	Incorrect Marginally correct Correct No information	0 1 2 9
6.	Are the direction for administration practical? Comments:	Impractical Marg. Practical Practical No information	0 1 2 9
7.	Are there clinically significant drug-drug interaction? Comments:	Major significant Minor significant Insight / no inter. No information	0 1 2 9
8.	Are there clinically significant Drug disease /condition interaction? Comments:	Significant Insignificant / no inter. No information	0 2 9
9.	Dose the patient experience any adverse drug reaction? Comments:	Definite Possible No ADR No information	0 1 2 9
10.	Is there unnecessary duplication with other drug(s)? Comments	Unnecessary Necessary/no dup. No information	0 1 9
11.	Is the duration of therapy acceptable? Comments:	Unacceptable Marg. Acceptable Acceptable No information	0 1 2 9
12.	Is the drug the cheapest compared to other alternatives for the same indication? Comments:	No Yes No information	0 1 9
13.	Is the medication being prescribed by generic name? Comments:	No Yes No information	0 1 9
14.	Is the medication available in the formulary or essential drug list? Comments:	No Yes No information	0 1 9

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

15.	Does the patient comply with the drug treatment? Comments:	Noncompliant Compliant No information	0 2 9
16.	Is the medication's name on the prescription clearly written? Comments:	Not clear Marginally clear Clear	0 1 2
17.	Is the prescriber's name on the prescription legible? Comments:	Illegible Barely legible Legible	0 1 2
18.	Is the prescriber's information on the prescription adequate? Comments:	Inadequate Adequate	0 2
19.	Is the patient's information on the prescription adequate? Comments:	Inadequate Marg. Adequate Adequate	0 1 2
20.	Is the diagnosis on the prescription clearly written? Comments:	Not clear/written Marginally clear Clear	0 1 2
21	Does the prescription fulfill the patient's requirement for drug therapy? Comments:	No Yes No information	0 1 9
22.	Has the patient's condition improved with the treatment? Comments:	Not improved Slightly improved Improved No information	0 1 2 9

RESULTS:

DISEASES	ONCOLOGY	NEPHROLOGY	CARDIOLOGY
1 Disease	32	18	21
2 Diseases	4	8	35
3 Diseases	2	9	12
4 Diseases	0	5	1
5 Diseases	0	3	0

In each department the samples were distributed according to the number of diseases per prescription. which summarizes the table 1.

Table:1. Number of diseases per prescription at department level

In Each department the samples were distributed according to the number of drugs per each prescription. which summarizes the table 2

Table:2. Number of drugs per prescription at department level

NUMBER OF DRUGS	ONCOLOGY	NEPHROLOGY	CARDIOLOGY
1 Drug	0	0	7
2 Drugs	0	0	20
3 Drugs	1	2	3
4 Drugs	6	9	4
5 Drugs	4	3	8

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

6 Drugs	5	4	7
7 Drugs	5	8	6
8 Drugs	3	4	7
9 Drugs	5	2	2
Above 10 drugs	9	11	5

PQI INDEX:

The PQI could be evaluated in about 15 to 20 minutes for each prescription, depending on the number of drugs in the prescription. All the patients' primary medical conditions were cardiology, nephrology or oncology departments and with or without other co-morbidities associated with it. Total 2 out of 150 prescriptions were of poor quality. Total 39 of prescriptions were of medium quality. Total 109 of prescriptions were of high quality at department levels. The details of quality of prescribing at department levels based on PQI scores is shown in below table 3.

Table:3. PQI score and quality of prescribing at department levels

QUALITY	PQI SCORE	DEPARTMENTS			TOTAL
		ONCOLOGY	NEPHROLOGY	CARDIOLOGY	
Poor	≤ 31	0	2	0	2
Medium	32 – 33	2	8	29	39
High	34 - 43	36	33	40	109

The mean scores for each PQI criterion was calculated and is depicted in table 4.

Table:4. Criteria wise mean PQI score (n=150)

Sr. No	Criterion	Maximum Score for Criterion	Score (N=150) (Mean ±SD)
1	Is there an indication for the drug?	4	3.35± 1.72
2	Is the dosage correct?	4	3.69 ±1.80
3	Is the medication effective for the condition?	2	2.44±0.74
4	Is the usage of the drug for the indication supported by evidence?	2	2.42 ±0.76
5	Are the directions for administration correct?	2	2.61 ±0.52
6	Are the directions for administration practical?	2	2.33 ±0.76

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

7	Are there clinically significant drug-drug interactions?	2	0.69 ±0.56
8	Are there clinically significant drug-disease/condition interactions?	2	1.57 ±0.70
9	Does the patient experience any adverse drug reaction (s)?	2	0.52 ±0.62
10	Is there unnecessary duplication with other drug(s)?	1	1.01 ±0.80
11	Is the duration of therapy acceptable?	2	2.17±0.86
12	Is this drug the cheapest compared to other alternatives for the same indication?	1	2.04 ±0.76
13	Is the medication being prescribed by generic name?	1	2.02±0.79
14	Is the medication available in the formulary or essential drug list?	1	0.26 ±0.59
15	Does the patient comply with the drug treatment?	2	1.16 ±0.86
16	Is the medication's name on the prescription clearly written?	2	2.60 ±0.55
17	Is the prescriber's name on the prescription legible?	2	2.87 ±0.35
18	Is the prescriber's information on the prescription adequate?	2	2.87 ±0.29
19	Is the patient's information on the prescription adequate?	2	2.51 ±0.54
20	Is the diagnosis on the prescription clearly written?	2	2.47 ±0.72
21	Does the prescription fulfil the patient's requirement for drug therapy?	1	1.35 ±0.74
22	Has the patient's condition (s) improved with treatment?	2	2.22±0.81
Total score		43	45.17±8.1

PQI criteria wise mean score comparison between Oncology, Nephrology & Cardiology departments is depicted in Table 5.

Table:5. Comparison of Criteria wise mean PQI score between Oncology, Nephrology & Cardiology departments.

Sr. No	Criterion	Max. Score for criterion	Oncology Score (N=38) (Mean ±SD)	Nephrology Score (N=43) (Mean ±SD)	Cardiology Score (N=69) (Mean ±SD)
1	Is there an indication for the drug?	4	1.97 ± 1.63	1.94±1.64	2.98 ±1.31
2	Is the dosage correct?	4	1.92 ± 1.74	1.97± 1.67	2.48 ±1.29
3	Is the medication effective for the condition?	2	0.99 ± 0.83	1.53±0.87	1.51 ±0.65

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

4	Is the usage of the drug for the indication supported by evidence?	2	0.93 ± 0.81	1.50± 0.84	1.41±0.63
5	Are the directions for administration correct?	2	1.50 ± 0.68	1.06± 0.60	1.80±0.42
6	Are the directions for administration practical?	2	1.15± 0.73	0.91± 0.84	1.80±0.40
7	Are there clinically significant drug-drug interactions?	2	0.27± 0.17	0.97± 0.24	1.58±0.51
8	Are there clinically significant drug-disease/condition interactions?	2	1.18± 0.48	0.47±0.89	0.76 ±0.45
9	Does the patient experience any adverse drug reaction (s)?	2	0.62± 0.60	1.13±0.50	0.55±0.50
10	Is there unnecessary duplication with other drug(s)?	1	0.27± 0.50	0.24±0.43	0.03±0.02
11	Is the duration of therapy acceptable?	2	2.0± 0.95	2.51±0.87	3.55±0.82
12	Is this drug the cheapest compared to other alternatives for the same indication?	1	0.81± 0.49	0.25±0.44	0.06±0.24
13	Is the medication being prescribed by generic name?	1	0.92± 0.49	0.92±0.32	0.32±0.47
14	Is the medication available in the formulary or essential druglist?	1	0.99± 0.41	0.99±0.12	0.97±0.85
15	Does the patient comply with the drug treatment?	2	0.99± 1.01	0.82±0.99	0.35±0.75
16	Is the medication's name on the prescription clearly written?	2	2.48± 0.56	2.06±0.45	2.62±0.51
17	Is the prescriber's name on the prescription legible?	2	2.97± 0.17	2.00±0.00	2.95±0.23
18	Is the prescriber's information on the prescription adequate?	2	2.00± 0.00	2.00±0.00	2.61±0.49
19	Is the patient's information on the prescription adequate?	2	1.94± 0.35	1.92±0.32	2.22±0.46
20	Is the diagnosis on the prescription clearly written?	2	1.62± 0.65	1.75±0.72	2.04 ±0.46
21	Does the prescription fulfil the patient's requirement for drug therapy?	1	1.58± 0.50	1.65±0.48	1.90 ±0.54
22	Has the patient's condition (s) improved with treatment?	2	1.61± 0.76	1.62±0.79	2.30 ±0.61
Total score		43	30.71 ± 8.82	30.21±9.33	36.79± 5.07

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

Each criterion scores for the three departments were compared with the help of Kruskal Wallis test (one-way regression analysis), P values are shown in table 6. Post hoc test Dunn's Multiple comparison was applied as Kruskal Wallis test showed significance difference ($p<0.05$).

Table:6. Comparison of criteria wise Quality of Prescribing between Oncology, Nephrology & Cardiology departments.

Sr. No	Criterion	Kruskal Wallis test (P Value)	Dunn's Multiple comparison (P Value)		
			Oncology Vs Nephrology	Oncology Vs Cardiology	Nephrology Vs Cardiology
1	Is there an indication for the drug?	<0.001	P>0.05	P<0.001	P<0.001
2	Is the dosage correct?	<0.001	P>0.05	P<0.001	P<0.001
3	Is the medication effective for the? condition?	<0.001	P>0.05	P<0.001	P<0.001
4	Is the usage of the drug for the indication supported by evidence?	<0.001	P>0.05	P<0.001	P<0.001
5	Are the directions for Administration correct?	<0.001	P>0.05	P<0.001	P<0.001
6	Are the directions for administration practical?	<0.001	P>0.05	P<0.001	P<0.001
7	Are there clinically significant drug-drug interactions?	<0.001	P>0.05	P<0.001	P<0.001
8	Are there clinically significant drug-disease/condition interactions?	<0.0001	P<0.001	P>0.05	P<0.001
9	Does the patient experience any adverse drug reaction (s)?	0.0329	P<0.05	P>0.05	P>0.05
10	Is there unnecessary duplication with other drug(s)?	<0.0001	P<0.05	P>0.05	P<0.001
11	Is the duration of therapy acceptable?	<0.0001	P<0.01	P<0.001	P<0.001
12	Is this drug the cheapest compared to other alternatives for the same indication?	<0.0001	P<0.001	P<0.001	P<0.01
13	Is the medication being prescribed by generic name?	<0.0001	P<0.001	P<0.001	P>0.05
14	Is the medication available in the formulary or essential drug list?	<0.0001	P<0.05	P<0.01	P<0.001
15	Does the patient comply with the drug treatment?	<0.0001	P>0.05	P<0.01	P<0.001
16	Is the medication's name on the prescription clearly written?	<0.0001	P<0.001	P>0.05	P<0.001
17	Is the prescriber's name on the prescription legible?	0.0038	P> 0.05	P>0.05	P<0.01
18	Is the prescriber's information on the prescription adequate?	--	--	--	--

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

19	Is the patient's information on the prescription adequate?	<0.0001	P<0.05	P<0.001	P>0.05
20	Is the diagnosis on the prescription clearly written?	<0.0001	P>0.05	P<0.001	P<0.001
21	Does the prescription fulfil the patient's requirement for drug therapy?	<0.0001	P<0.05	P>0.05	P<0.001
22	Has the patient's condition (s) improved with treatment?	<0.0001	P>0.05	P<0.001	P<0.001

DISCUSSION:

This study was planned to evaluate the quality of prescribing for chronic conditions in the outpatient setting of tertiary level health care facility in departments like Oncology, Nephrology & Cardiology with the help of PQI tool. This tool has been developed by considering the already established tools like MAI, START, STOPP & Beers criteria. The PQI tool is a comprehensive tool covering multidimensional criteria of prescribing process. It has been validated and claimed to be reliable. As there is no study reporting use of this tool, this prospective, cross sectional study was planned to assess prescribing quality at tertiary health care facility in selective departments using PQI tool and its reliability in Indian setting. The study was carried out at Manipal super specialty hospital located in Vijayawada, Andhra Pradesh state of India.

The Prescription Quality Index (PQI) tool contains 22 criteria in questionnaire form. The PQI was developed with a strong structural foundation and claims to capture clinical, clerical and legal requirements of a prescription. The PQI is also claimed to capture the multidimensional criteria of prescription quality. The PQI incorporates the concept of rational drug therapy, evidence-based approach and other criteria required for prescription quality. Furthermore, PQI was able to discriminate between the proportion of good prescriptions and prescriptions with problem. We believe that the use of this tool will enable the quality of prescription to be measured, analyzed and monitored. Therefore, the benefits of interventions can be examined for further improvement in patient care.[5] As it is obvious, prescribing problems are likely to be more in chronic illnesses. In the same way, higher incidence of inappropriate prescribing is expected in geriatric patients due to multiple morbidities and polypharmacy. Researchers and quality improvement programs have often established a set number of medications beyond which prescribing is considered to be ''polypharmacy'' and to merit extra attention for potential quality problems.[18] A study of prescription database, which stated that as age increases, there is higher risk of complications and more drugs required for treatment.[19] Several studies have demonstrated that the frequency of unnecessary or non-recommended medication use is higher in patients taking many medications than in those taking few medications.[20-22] The different prescribing parameters and the distribution of different categories of drugs in the prescriptions analyzed in this study provided an insight into the prescribing behavior of the physicians at department levels of health care facility.

Data was collected for three days a week by taking the inclusion criteria into consideration. The quality of prescribing was evaluated using 22 criteria of the Prescription Quality Index tool. If prescriptions consisted of more than one drug, each drug was rated individually. Similarly, if patients suffered from more than one disease, each disease state was rated separately. The PQI total score was obtained by summing up all the minimum scores for the 22 criteria for all drugs in a prescription. The possible maximum score of the PQI was '43'. Prescription with the PQI total score of ≤31 was interpreted as poor quality, scores 32 and 33 as medium quality and scores 34 to 43 as high quality as described in PQI tool. Total 150 prescriptions were collected from three departments namely Oncology (38), Nephrology (43) and Cardiology (69) during the study period. The pilot study was conducted using 18 prescriptions to validate the PQI tool and results obtained are satisfactory, then proceeded to the main study with the remaining 132 prescriptions and thereby finally got the results.

CONCLUSION:

Based on our findings of prescription quality using PQI tool, the tool was constructed and validated with a pilot study, then proceeded into the main study where the results are out of 150 prescriptions a total number of 109 prescriptions were of high quality (34-43), 39 were of medium quality (32-33) & only 2 were of poor quality (≤31). There is no difference among the departments because all the prescriptions were of good quality except a two from Nephrology department. PQI is a valid and reliable tool for measuring prescription quality in Indian health care setup and can be useful for observational as well as interventional studies.

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CONFLICT OF INTEREST: The authors exhibit no conflicts of interest

ABBREVIATIONS:

PQI - Prescription Quality Index

MAI - Medication Appropriateness Index

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

STOPP - Screening Tool of Older Persons' Potentially Inappropriate Prescriptions
START - Screening Tool to Alert doctors to the Right Treatment
WHO - World Health Organization
IPET -Improved Prescribing in The Elderly Tool

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