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RESEARCH ARTICLE

STUDY TO EVALUATE THE PRACTICE OF CONVERSION OF IV TO ORAL ANTIBIOTICS AND ASSESSMENT OF RATIONALITY

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ABSTRACT

The appropriate use of antimicrobial agents is crucial for patient's safety and public health. One way of optimizing antibiotic use is to switch earlier from intravenous to oral therapy. The main types of conversion are sequential therapy, switch therapy and step down therapy. The aim of the study is to evaluate the practice of conversion of intravenous (IV) to oral antibiotics and to assess the rationality of antibiotic therapy. A prospective observational study was done for a period six months at a tertiary care hospital, Palakkad. A standardized data entry form was prepared to record all patient details, investigations and therapy given. About 145 patients were observed and the study shows that cephalosporins (56.5%) were the mostly prescribed IV antibiotics. Step down type conversions were mostly observed type of conversion that is of 45.3% followed by switch type (35.9%) and sequential type (18.7%). Polypharmacy was the major cause for irrationality.

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INTRODUCTION

The appropriate use of antimicrobial agents is crucial for patient's safety and public health. (Pardo *et al*., 2016) The most commonly used antibiotics such as beta-lactams, glycopeptides, or macrolides, antimicrobial killing is not dependent on the peak levels but rather on the period of time during which antibiotic levels are above the minimum inhibitory concentration. The time above minimum inhibitory concentration is similar for well-absorbed oral antibiotics compared with intravenous antibiotics. Exceptions to this rule are aminoglycosides and quinolones, in which antimicrobial killing is related to the peak concentrations achieved. One way of optimizing antibiotic use is to switch earlier from intravenous to oral therapy. The optimal time for switching to oral antibiotics is on days 2–4 of IV therapy. (Pardo *et al*., 2016; Shrayteh *et al*., 2014; Engel *et al*., 2013; Ho Kwong Li *et al*., 2015)

There are mainly three types of conversions. (Shrayteh *et al*., 2014; Engel *et al*., 2013; Cyriac, 2014)

- Sequential therapy: It refers to the act of replacing a parenteral version of a medication with its oral counterpart of the same compound. (Shrayteh *et al*., 2014; Cyriac, 2014)
- Switch therapy: It describes the conversion of an IV medication to a PO equivalent; within the same class and has the same level of potency, but of a different compound. (Shrayteh *et al*., 2014; Cyriac and James, 2014)
- Step down therapy: It refers to the conversion from an injectable medication to an oral agent in another class or to a different medication within the same class where the frequency dose, and the spectrum of activity (in the case of antibiotics) may not be exactly the same. (Shrayteh *et al*., 2014; Cyriac and James, 2014)

Irrational antibiotics usage is a global problem resulting in an increased emergence of bacterial resistance, higher cost of treatment, prolonged hospitalization and adverse drug reactions. (Holloway, 2011; Julian Mettler *et al*., 2007; Bbosa *et al*., 2014) The aim of the present study is to evaluate the practice of conversion of IV to oral antibiotics and to assess the rationality of antibiotic therapy.

MATERIALS AND METHODS

The prospective observational study was conducted during a period of 6 months (November 30, 2016- April 30, 2017) at a

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tertiary care hospital, Palakkad. The study was conducted according to the guidelines set by the Ethical Committee of the hospital. A total of145 patients were evaluated. Inpatients receiving IV antibiotic for more than 48 hours and able to tolerate oral formulation were included in the study. Excluded from the analysis were, patients: younger than 10 years of age, Pregnant and lactating mothers, patients with malignancies or admitted to ICU, patients with serious/ life threatening infections. Information on demographics, admission diagnoses, empirical and adjusted antibiotic therapies, duration of therapy, results of microbiological investigations were prospectively recorded on a standardized data entry form. Treatment charts of the patients were reviewed for the prescription patterns of antibiotics by the clinicians and were followed up with oral conversion. The assessment of rationality of antibiotic therapies were done using rationality parameters by World Health Organization (WHO).

RESULTS

The study consist of 145 patients among which 79 were male and 66 were female. Most of the patients were under the age group of 61-70years (18.6%) followed by 31- 40years (17.9%), 41-50years (16%) and 51-60 years (15.1%). Out of 145 cases, RTI(54.4%) was the most commonly seen disease followed by skin and soft tissue infections (14.4%), UTI(9.6%), metabolic disorder (5.5%), GI infections (6.2%), carcinoma(3.4%) and fractures (6.2%).

Pattern of antibiotic utilization

Table 1. IV antibiotics given among study population

Class	No. of Drugs	Percentage (%)
Cephalosporins	130	56.5
Fluroquinolones	34	14.7
Aminoglycosides	25	10.8
Glycopeptides	2	0.8
Imidazole	26	11.3
Penicillin	13	5.6

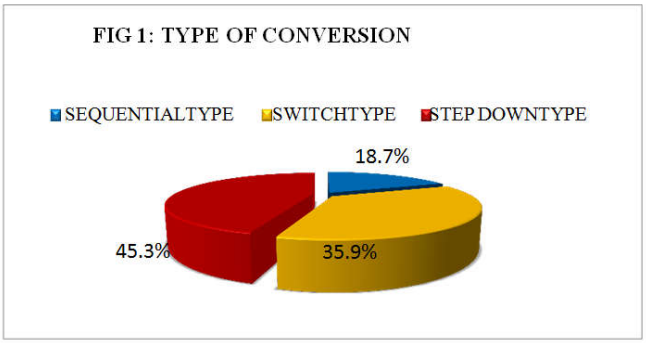
As shown in Table 1, Cephalosporins were the mostly prescribed IV antibiotics followed by Fluroquinolones, Aminoglycosides, Imidazoles, Penicillin and Glycopeptides.

Table 2. Converted oral antibiotics

Class	No. of Drugs	Percentage (%)
Cephalosporins	49	41.3
Fluroquinolones	43	40.1
Aminoglycosides	10	8
Glycopeptides	6	5
Imidazole	6	5
Pencillin	2	2
Tetracyclins	3	3

From table: 2, most of the IV antibiotics were converted to oral Cephalosporins followed by Fluroquinolones, Aminoglycosides, Glycopeptides and Imidazole, Tetracyclines and Penicillins.

Type of conversion



From the Fig.1, the most frequent type of conversion was found to be step down conversions followed by switch type and sequential type.

Table 3. Barriers of conversion

S.No.	Patient related barriers	No. of Cases	Percentage (%)
1	Failure to take oral medication	27	24.2
2	Comorbidity	43	38.3
3	Elderly	32	28.1
4	Non adherece to therapy	12	10.3
Clinical course related barriers			
2	Patient feels ill	10	23.25
3	Fever	9	20.9
4	Dyspnea	15	34.8
5	Dyspnea with fever	7	16.2
6	Hemodynamically unstable	2	4.6
Additional diagnostics barriers			
1	Elevated esr	17	29.31
2	Secondary infection	19	32.7
3	Unavailability of culture reports	22	37.9
Physician specific barriers			
1	Conversion possible but forgotten	13	37.14
2	Lack of knowledge and experience	18	51.42
3	Prescribed drug	4	11.42

Barriers of conversion

Barriers affecting conversion includes patient related barriers, clinical course related barriers and additional diagnostic barriers. The major barriers delaying conversion are shown in Table 3. In Patient related barriers, comorbidities were the commonly observed barrier followed by elderly, failure to take oral medication and non-adherence to therapy. Among clinical course barriers, dyspnea and patient is still ill were the most commonly seen barriers that is of followed by patient feels ill, fever, dyspnea with fever and hemodynamically unstable. Among additional diagnostics barriers ESR elevation was the commonly seen barrier followed by secondary infection and unavailability of culture and In Physician Specific barriers lack of knowledge and experience of the physician is the most common barrier followed by another barrier that is, a switch to oral agent is possible but forgotten and characteristics of prescribed drug such as unavailability of oral variant.

Rationality assessment of prescription

Irrational use of drugs is the global problem resulting in an increased emergence of bacterial resistance, higher cost of treatment, prolonged hospitalization and adverse drug

reactions. As shown in the Table 4, the average number of drugs prescribed per prescription was 3.90. Among that 5.4% of the drugs were prescribed in their generic names. Out of 566 drugs, 513 drugs were prescribed from Essential Drug List 2016-2017 and the percentage of antibiotics prescribed was about 90.63%.

Table 4. Assessment of rationality using WHO parameters

Parameters	Total drugs	Average/ percentage (%)	Who standard derived or ideal (%)
Average number of drugs prescribed	566	3.90	1.6 - 2
Percentage of number of drugs in edl	513	90.63	100
Percentage of number of antibiotics precribed	399	70.49	20.0-26.8
Percentage of number of iv injections prescribed	279	49.29	13.4-24.1
Percentage of number of drugs in generic name	31	5.4	100

DISCUSSION

In our study we observed that the barriers delaying the switch were mainly patient barriers and additional diagnostic barriers but in study conducted by Engel *et al*. (2013), patient barriers and physician barriers are the most common barriers delaying the conversion. In our study, we found that switching of IV betalactams antibiotics (especially cephalosporin 3rd generation) to PO alternative was rare and the modification was done through discontinuation of the drug on the day of clinical stability rather than switching to PO therapy and similar results were observed in the study conducted by Shrayteh *et al*. (2014)Average number of drugs per prescription reported in this study was 3.90, WHO has recommended the average number of drug per prescription should be 2.0. This study produced similar type of result as that of study conducted by Vijayakumar *et al*. (2011). The results reflects polypharmacy. Also it was observed that the usage of antibiotic was high in this study which was contradictory with the previous study (Vijayakumar *et al*., 2011). The study also shows that the percentage of drugs prescribed by generic name was 5.4% which is extremely low compared to the standard derived to serve as ideal (100%), In a similar study carried out by (Anteneh, 2013), the percentage of drugs prescribed by generic name was found to be 98.7%, is almost similar with the standard. The percentage of encounters in which antibiotics were prescribed was found to be 70.49%, which is very high compared to the standard (20.0%-26.8%) derived to be ideal and the percentage of encounters in which an injection was prescribed was found to be 49.29 %, which is higher than the standard (13.4%-24.1%). The percentage of drugs prescribed from the essential drug list was about 90.63%, which is near to identical with the standard (100%) derived to serve as ideal. The practice of conversion of IV to oral antibiotics were evaluated and the step down type conversion is the most common type practiced in this hospital. The study suggests that switch from IV to oral antibiotics was unnecessarily delayed in patients due to different type of barriers such as patient related barriers, clinical course related barriers and additional diagnostic barriers. The study also assess the rationality of prescriptions.

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