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CURRENT PRACTICE OF INTRAVENOUS TO ORAL CONVERSION OF ANTIBIOTICS AT A TERTIARY CARE HOSPITAL: A PROSPECTIVE STUDY

Dr. Sneha Sebastian*[1], Dr. Priya Saji Koliyakodu[2], Dr. Sherine Justin[3], Gayatri P. Sapkale[4], Dr. Vishnu V. K.[5]

[1,2,3]Pharm D (Doctor of Pharmacy) Intern, Nandha College of Pharmacy, Koorapalayam Pirivu, Erode-638052.
[4]HOD of Clinical Pharmacology Department, Venkateshwar Hospital, Sector-18A, Dwarka, Delhi-110075.
[5]Clinical Pharmacologist, Venkateshwar Hospital, Sector-18A, Dwarka, Delhi-110075.

***Corresponding Author: Dr. Sneha Sebastian**

Pharm D (Doctor of Pharmacy) Intern, Nandha College of Pharmacy, Koorapalayam Pirivu, Erode-638052.

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ABSTRACT

Introduction: The patients admitted in general ward of a hospital with severe infections who adequately absorb oral medication and initially require IV therapy can be safely switched to oral therapy within 2-3 days. There are number of advantages like fewer complications and decreased length of hospital stay (LOHS). **Aim**: To evaluate the practice of switching from IV to oral antibiotics, identification of IV complications in non-converted patients, case related barriers to an early switch and thereby influence in LOHS. **Materials and Methods**: A prospective observational study was conducted over a period of 3 months from March-May 2019. NUH guidelines were used to evaluate the early switch based on clinical stability. Clinical based end points such as complications, barriers for conversion, duration of antibiotics and LOHS were assessed. **Results:** The study reveals that among antibiotic courses, 51% and 49% were converted and non-converted respectively. Sequential conversion therapy was more commonly used than switch and step-down therapy. IV complications (49%) were identified in non-converted patients, pain (57.1%) followed by phlebitis (36.7%) and extravasation (6.12%). By means of case-specific interviews, barriers (49%) were identified for conversions. The most frequently mentioned barriers were "supervisor's opinion" in 9 (18.3%) cases followed by different patient factors. Duration of IV therapy and LOHS for patient population had significantly ($p<0.05$) decreased following IV to PO conversions compared to non-conversion therapy. **Conclusion:** Switching of antibiotics based on predefined criteria for clinical stability lead to decreased rate of complication from IV lines and thereby decreased LOHS.

KEYWORDS: IV to PO conversions, switch therapy, sequential therapy, step-down therapy.

INTRODUCTION

Infectious diseases are disorders caused by various microorganisms which live in and on our bodies. They're normally harmless or even helpful, but under certain conditions, some may cause diseases. These infectious diseases should be treated with appropriate antibiotic therapy. The appropriate use of antibiotics is based on the selection of an agent capable of achieving a desired serum concentration to target the presumed organism at the site of infection with an acceptable safety profile.[7] Antibiotics are administered through the IV route for the best results. But at times there is a need for conversion from IV to oral route. Antibiotics are considered suitable for IV to oral conversion if they have appropriate spectrum, high degree of activity against the presumed or known pathogen, and have good availability. At times even after the patient is capable to take bioequivalent oral alternatives, they remain on expensive IV medications.[2] One way to optimise antibiotic use is to switch earlier from IV to oral therapy, with the following advantages: (i) benefits to the patient (ii) lower costs and (iii) reduced workload (iv) shorter hospital stay (v) reduced incidence of catheter related infections.[15]

These conversions from IV to ORAL may be "switch therapy", "sequential therapy" or "step down therapy". IV to PO switch programmes are highly appropriate and more applicable to antibiotics such as fluroquinolones (levofloxacin), Tetracyclines (Doxycyclines), Macrolides (Clindamycin), Co-trimoxazole, Linezolid.[10] This intravenous to oral switch conversion is based on NUH antibiotic guidelines version 2.[3]

MATERIALS AND METHOD

Study design and study population

Our study was prospective observational, conducted in Venkateswar Hospital. Patient data was obtained and collected from the medical case files. Study population includes patients hospitalised for more than 48 hours.

Inclusion and exclusion criteria

Adult inpatients improving clinically and receiving IV antibiotics for more than 48 hours and those patients with

a functional GI tract, is able to take oral nutrition or medications and there is no evidence of malabsorption were included.

Patients younger than 18 years of age and having an unreliable response to oral therapy due to continuous malabsorption syndrome, short bowel syndrome, protracted vomiting, severe diarrhoea and those patients with malignancies, or admitted to cardiac or intensive care and surgery units. Patients who received IV prophylactic antibiotics or if a prolonged course of IV antibiotics was required as in case of endocarditis, meningitis, osteomyelitis, staphylococcus aureus bacteremia were excluded.

Data collection

Patient data were collected from the respective medical records, which included demographic characteristics of the patient, co-morbidities, allergies, primary diagnosis or indication for antibiotic therapy, antibiotics administered, specifying the type, route and duration of IV therapy, IV complications and LOHS. The type of modification whether discontinuation or conversion from IV to PO therapy was also recorded. Data regarding the signs and symptoms in order to assess the clinical stability (temperature less than 38 degree Celsius, blood pressure > 90mmHg, heart rate <90bpm, WBC count normal or a decrease of at least 2000 cells per microliter over the last 24 hours, respiratory rate).

Data were also collected from a questionnaire prepared in order to identify the possible and perceived case specific barriers.

Outcomes

The principle outcome was to evaluate the practice of switching of IV antibiotic therapy and type of conversions from IV to ORAL when a switch was done based on inclusion criteria for clinical stability.

Secondary outcome to identify the IV complications in Non-converted population, possible perceived case related barriers to a switch, duration of IV therapy and length of hospital stay.

Statistical analysis

The statistical analysis was performed using Graphpad Prism Software version 5.0. Categorical data were represented as percentage frequency whereas continuous data were presented as mean±SD. The two groups of patients (i.e., converted and non-converted) were compared for statistically significant differences using Chi-square test for the categorical variable and student t-test for continuous variables (duration of IV therapy and LOHS). The tests were considered statistically significant when $p<0.05$.

RESULTS

Of the total number of eligible patient population, females shows higher in number and shows higher frequency in the age group of 18-38. While male patient were in the age group of 39-59 years [Fig. 1]. Out of 100 patients "converted from IV to PO" accounted for 51(51%) while "non-converted from IV to PO" accounted for about 49(49%). Among 51 converted sequential [male; 13(40.6%), female; 19(59.3%)] switch[male; 4(40%), female; 6(60%)] and step down therapy[male; 2(22.2%), female; 7(77.7%)] and from it was observed that sequential conversion therapy was the most frequent among the study populations [Fig. 2].

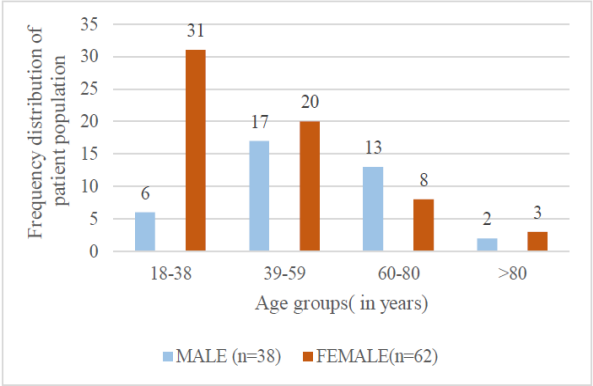

Fig. 1: Age and gender wise distribution of study population.

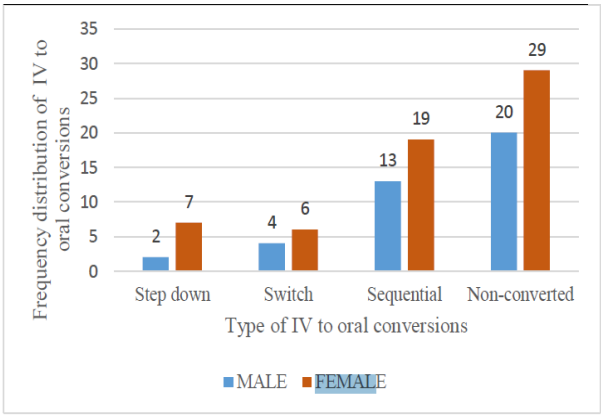

Fig. 2: Frequency distribution of types of IV to oral conversions based on gender.

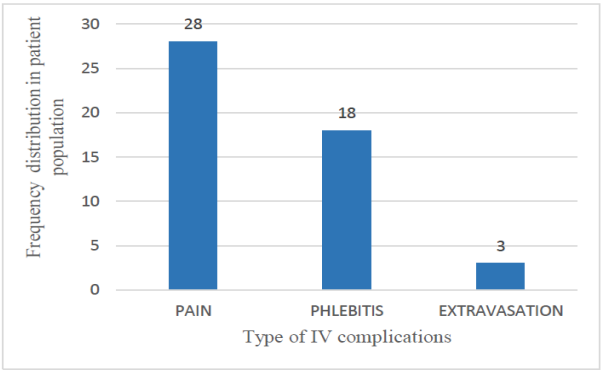

Fig. 3: Frequency distribution of types of IV complications in non-converted patient populations.

[Fig. 3] illustrates the frequency of IV complications in non-converted patient population. Total number of IV

complication accounts for about 49(100%). Pain ranked first among complications followed by phlebitis and extravasation, 28(57.1%), 18(36.7%), 3(6.12%) respectively.

By means of case-specific interviews, we evaluated the barriers of 49(49%) of non-converted patients [Fig. 4]. The most frequently mentioned barriers were "supervisor's opinion" in 9(18.3%) cases followed by patient factors include comorbidities in 7(16.4%) cases and "a switch to oral agents was possible, but forgotten" mentioned in 4(8.1%) cases.

Fig. 4: Case specific barriers for the conversion from IV to oral therapy.

Factors	Qualitative Answers	Frequency
		Case Specific(n=49)
Physician factors	Opinion of supervisor	9(18.3%)
	Forgot	4(8.1%)
	Practise experience	0
	Delay due to resident	0
	Other	NA
Patient characteristics		
Patient factors	Absorption orally not secured	NA
	Co-morbidity	7(16.4%)
	Elderly greater than 85yrs	0
	Therapy adherence not secured	0
Clinical course	Patient very ill at admission	1(2.0%)
	Patient still ill	3(6.1%)
	Patient feels ill	1(2%)
	Fever	3(6.1%)
	Fever subsided<24hrs ago	2(4%)
	Dyspnoea or oxygen needed	3(6.1%)
	Haemodynamicaly unstable	2(4%)
Additional diagnostics	Elevated CRP	3(6.1%)
	High leukocytes	1(2%)
	Abnormalities on chest radiography	1(2%)
	Confusion/delirium	0
	Pleural effusion/abscess	0
	Secondary infection	0
Other		
Antibiotics	No oral variant for IV agent	1(2%)
	Allergy or toxicity oral variant	2(4%)
	Recent change in antibiotic regimen	1(2%)
	Short duration of IV therapy	1(2%)
Microbiology	Culture results still unknown	3(6.1%)
	Causative pathogen is atypical	1(2%)
Admission related	Patient stays admitted or needs IV medication for other reason	0

DISCUSSION

Most of the patients admitted, who are initially prescribed with IV antibiotics, can be switched from IV to Oral therapy, once the clinical stability markers are met, provided that the total course of therapy duration is completed. Using the defined criteria for IV to PO switch, 49(49%) of the antibiotics source in the study were not switched to PO therapy, despite improvements in clinical signs of infection.

In the present study, 49(49%) i.e., non-converted patient shows IV complications. The frequency of pain was exceeding in this study 28(57.1%) than phlebitis and extravasation. Complications occurs mainly due to the failure to switch over, when the patient is clinically stable, type of antibiotic infusions, insertion site, insertion site preparation, failure to change the catheter after 48 hours.[8]

Perceived barriers to an early switch strategy included mainly practical considerations, misconceptions and unfamiliarity with the guideline recommendation. Physicians were probably not aware of the existence of

clear guidelines and on the adequate timing of conversion.

It is therefore, majority of the barriers identified in the study could be reduced by educational interventions mainly by Infection Control Committee. These barriers are also reflected in many previous studies.[6,9]

Administered antibiotic courses of therapy that were switched to a suitable PO formulation were few and mostly involved Fluroquinolones, macrolides and metronidazole classes because these antibiotics are available in both IV and PO formulation were sequential type of conversion is used and secondly, sequential therapy is probably easiest way to follow and poor awareness about the switch and step down therapy.[1]

On the other hand, number of antibiotic courses on beta lactams (specifically third generation cephalosporins) alternatives were rare. Cephalosporins were discontinued rather than switching to PO therapy.[14] Drugs such as ceftriaxone with no PO equivalent and his conversion was done using step down conversion therapy. On the basis of clinical stability mean number of days of IV to PO conversion was found to be 3.87 days in case of sequential therapy which it correlated with the previous studies that the appropriate time for IV therapy to be measured between 2.0-4.0 days.[4,5] On the contrary, the mean number of days of IV to PO conversion in switch and step down therapy was found to be 4.1 and 3.7 respectively. The delay in conversion of switch and step down therapy would increase cost burden on the patient.

In this study, mean length of IV therapy was around 8.08 days for non-converted patients compared to around 5.94 days for the converted ones. LOHS had significantly ($p<0.05$) decreased following IV to PO conversions. IV to PO conversions could possibly reduce the hospital stay of patients[11], however reduction in LOHS was not observed.[12] Even though duration of IV therapy is significantly reduced in patients who were converted. By contrast, in the present study, duration of IV antibiotics has not been significantly decreased following IV to Oral conversion.[1]

LIMITATIONS

Clinical pharmacist intervention could not be predicted since our study is a prospective observational study for 3 months with a limited sample size. Although criteria for the clinical stability were defined in the evaluation of appropriate IV to ORAL conversion, the impact of other factors that influenced clinical decisions (example: complications due to co-morbidities, physician related barriers for the non-conversion, lack or missing data for daily eligibility criteria) were not assessed.

CONCLUSION

Switching of antibiotics based on predefined criteria for clinical stability lead to decreased rate of IV complication and thereby could reduce length of hospitalisation of patients.

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