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The Impact of IV to Oral Antibiotics Conversion on Clinical and Pharmacoeconomical Outcomes

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ABSTRACT

The hospital based study was carried out to study the impact of IV to oral (PO) antibiotics conversion on clinical and pharmacoeconomical outcomes. And to describe the effect of conversion on the length of hospital stay (LOS) & total treatment cost. The three types of IV to PO conversion include, Sequential, Switch & Step Down**.** Out of 52 patients enrolled in the study, 33(63.46%) were males and 19 (36.53%) were females. From which 49(94.23%) were converted & 3(5.76%) were discontinued, among the continued subject's maximum conversion observed was Switch 23(44.23%) which is followed by Sequential 18(34.61%) & Step Down by 11(21.15%). Prophylaxis 25(51.02%), 20(40.81%) Treatment of documented disease & 4(8.20%) Empirical therapy was the reason for continuation. Among the total antibiotics (115), Cephalosporin 39(33.91%), Betalactamase inhibitor 20 (17.39%), Fluroquinolone 19(16.52%), Aminoglycoside 10(8.69%), Penicillin 6(5.21%), Uredopenicillin, Oxazolidone & Sulfonamide 1(0.86%) were prescribed. From the total 49 converted cases 63 times total conversions took place based on their class wise categorization which includes, Cephalosporin's 36(57.14%), Fluoroquinolones 10(15.87%), Antiprotozoal 8(12.69%), Beta lactamase inhibitor 5(7.93%), Penicillin 4(6.39%). And the classes which were not converted are as follow Betalactamaseinhibitor 11 (35.48%), Aminoglycoside 9 (29.08%), Antiprotozoa l5 (16.12%), Cephalosporin & Fluoroquinolones by the same number of 2 (6.45%). From 63 times of total conversions 21 times switch [cephelosporins 21 (33.33%)], 29 times sequential [Cephalosporin 5 (7.93%), Fluoroquinolones 9 (14.28%), Betalactamase inhibitor 4 (6.34%), Penicillin 4(6.34%), Antiprotozoal 7(11.11%)], and 13 times step down [Cephalosporin 9(14.28%), Fluoroquinolones, β lactamase inhibitor, Penicillin & Antiprotozoal 1(1.58%) resp.] conversions took place. Out of total 966 prescriptions total IV antibiotics were 538 (55.69%) [Cephalosporin 280(28.98%), Betalactamase inhibitor 86(8.90%), Fluoroquinolones 68(7.03%), Penicillin 36(3.72%), Antiprotozoal 56(5.79%), Uredopenicillin 12(1.24%)] times were prescribed & Oral antibiotics were prescribed for 428(44.30%) times [Cephalosporin 236(24.43%), Fluoroquinolones 70(7.24%), Betalactamase inhibitor 38(3.93%), Antiprotozoal 38(3.93%), Penicillin 46(4.76%)]. Length of hospital stay was observed from three specific wards in our hospital which were General (IV 4.4 days & PO 3.7 days), special ward (IV 3.5 day & PO 2.8 days) & Semi special (3.5 days & 3.1 days). And per day total antibiotics cost was Rs. 1988.50, in which total of per day IV cost was Rs. 1842.87(92.67%) and total of per day PO cost was 145.63(7.32%). Per day total treatment cost for each department was Rs. 19546.90, in which per day total IV treatment cost was Rs. 12185.01(62.33%), & per day total PO treatment was Rs. 7361.89(37.62%), and the potential cost difference among total IV & total PO is Rs. 6413.58 (24.71%). which indicates early switch leads to early discharge & reduction in total treatment cost.

INTRODUCTION

Antibiotics are the most commonly used and costly drug group in hospital. On average one third of patients receive antibiotic therapy, 40% of whom receive an intravenous (IV) agent Up to 40% of prescriptions are incorrectly prescribed or inappropriate, often reflecting over-use of expensive broad-spectrum IV agents [1].

Bioavailability of IV medications is always higher than that of their oral counterpart, so that the patient may get relief from symptoms earlier if they receive a complete IV course of therapy, is a concept that is popular among the physicians. But the fact is that for a large number of medications, essentially the same amount of drug is found in the blood when given intravenously or orally. Moreover, they believe that chances of reinfection will be less if they give a complete IV course of antibiotics. As a result, physicians usually tend to opt for the IV medications at the time of admission and continue them till patient discharge [2].

The recognized frequent misuse and overuse of antibiotics in hospitals, and the impact of it on therapeutic efficacy, bacterial resistance and costs warrant the implementation of programmes to improve the use of antibiotics in hospitals especially in countries with limited resources [3].

One of the methods to improve antibiotic prescribing is by implementing switch therapy. 'Switch therapy' is used to describe the conversion of intravenous (iv) to oral therapy, using the same or a different compound, as soon as patients are judged clinically stable, according to specified criteria, without the loss of antimicrobial potency. Other similar terms used include 'streamlining', 'sequential' therapy and 'step-down' therapy. The benefits of timely and appropriate iv to oral switch are well recognized and include: (i) decreased duration of iv therapy (ii) decreased drug acquisition, hospitalization and non-drug costs (iii) decreased workload and nursing time (iv) decreased length of hospitalization and (v) decreased side effects associated with iv lines [3].

Patients that are started on parental therapy become candidates for conversion to oral therapy as their conditions improve and they prepare for discharge. This route of administration may be ideal so long as the medication achieves the desired concentrations in blood and/or the targeted site of action [2].

In the Indian scenario, the concept of early switch over from IV to oral therapy is not common even though it is popular in Western countries [2].

With availability of potent highly bioavailable oral antibiotics, there is an opportunity to promote switching from IV to oral therapy earlier and potentially reduce length of stay as a result. The availability of high bio available agents such as oral quinolones, macrolides and cephalosporins over the last two decades has transformed over ability to safely and effectively manage patients with a range of infection [4].

When selecting an antibiotic, it is recommended that the clinician follows the antimicrobial creed of **MINDME**:

M Microbiology guides therapy wherever possible

I Indications should be evidenced based

N Narrowest spectrum required

D Dosage appropriate to the site and type of infection

M Minimize duration of therapy

E Ensure monotherapy in most cases [5]

Criteria for patient eligibility:

Inclusion Criteria

- Patients improving clinically
- Tolerating food or enteral feeding
- Able to adequately absorb oral medications via the oral, gastric tube, nasogastric tube route
- Not displaying signs of shock, not on vasopressor blood pressure support
- Taking other medications orally [6]

Additional requirements for antimicrobials:

- Afebrile for at least 24 hours (temperature ≤100°F or ≤37.8°C)
- Heart rate ≤90 beats per minute o Respiratory rate ≤20 breaths per minute
- Systolic blood pressure ≥90 mm Hg (without vasopressor drugs) [6]

Signs and symptoms of infection improvement according to assessment:

- Improving WBC and differential counts
- Improving signs and symptoms
- Hemodynamically stable
- Patient is not septic

Exclusion Criteria

- Persistent nausea and vomiting, diarrhea
- Patient with the following GI conditions:
- Ileus or suspected ileus with no active bowel sounds
- Patient is known to have a malabsorption syndrome
- Proximal resection of small intestines
- High nasogastric (NG) tube output or requiring continuous GI suction (>500mL/day)
- Active GI bleed
- Cystic fibrosis
- Patients with Grade III or IV mucositis
- Wernicke's encephalopathy (for thiamine interchange)
- Acute pain (for IV acetaminophen interchange)

 Myxedema coma or if endocrine consulting (for IV levothyroxine) [6]

Additional exclusions for antimicrobials:

 Patient has a serious or life-threatening infection:

 Meningitis, endocarditis, intracranial abscesses, osteomyelitis, septicemia, Legionella pneumonia

 Inadequately drained abscesses and empyema

 Severely immunocompromised (solid organ transplant, bone marrow transplant)[6]

Advantages of oral over IV route

Early switch over from IV to oral therapy has the following major advantages:

- Reduced risk of cannula-related infections: For the administration of IV medications, one is required to insert a cannula, which remains in place for some days and eventually can result in secondary infections caused by bacteria and fungi. This may ultimately lead to the need for additional antibiotics and subsequently financial burden to the patients.

- Risk of thrombophlebitis: No risk of thrombophlebitis in case of oral administration.

- Less expensive than IV therapy: Most of the oral medications available at the market are less expensive as the parenteral medications must be sterile and isotonic, consequently leading to cost savings by the patients.

- Reduction in the hidden costs: Hidden costs mainly refer to cost of diluents, equipment's for administration, needles, syringes, and nursing time. Needles, syringes, diluents, and other equipments are the unavoidable requisites for the parenteral administration. Above all, an experienced professional must be there to administer the injection. As a result, it may cause a financial burden for the patient and take away valuable nursing time for patient-care.

- Earlier discharge: Injections are usually administered in a hospital setting as it requires an experienced professional to administer the medication, especially IV infusions. Hence the patient stays at the hospital is prolonged. Early switch over to oral medications can help to overcome this barrier and may result in early discharge of the patients [2].

Types of IV to oral conversions

There are mainly three types of IV to PO conversions.

- **Sequential therapy:** It refers to the act of replacing a parenteral version of a medication with its oral counterpart of the same compound. For instance, conversion of inj. pantoprazole 40 mg OD (once daily) to tab. pantoprazole 40 mg OD.

- **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. For example, switch over from inj. ceftriaxone 1 g BD to tab. cefixime 200 mg BD, switch over from inj. pantoprazole 40 mg BD to tab. rabeprazole 20 mg BD.

- **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. For example, conversion of inj. cefotaxime 1 g to tab. ciprofloxacin 500 mg, switch over from inj. heparin to tab. Warfarin[2].

When to Switch

The optimal time to consider switching a patient to oral therapy is after 2 to 4 days of intravenous therapy. This period of time allows the clinician to evaluate the patient's microbiology results and assess their response to treatment. A large number of clinical trials support the early switching to oral antibiotics after this period of time with equal treatment efficacy and no adverse effects on patient outcome [7].

MATERIAL AND METHODS

Study design and settings

Hospital based prospective observational study was carried out for a period of three months. Patients hospitalized for more than 24 hours were evaluated for conversion from IV to PO antibiotics based on their inclusion & exclusion criteria. Patient's information was obtained from the medical records of respective wards (General Ward, Special Ward & Semi special Ward) in a tertiary care hospital Shri B.M. Patil Medical College Hospital and Research Centre Vijaypur of south India. The selected 52 patients were enrolled in to the study and

evaluated for the study parameters, such as demographic details of patients, reason for conversion, number of cases converted or discontinued, type of conversion in total cases, total number of antibiotics, conversion of IV drugs to PO drugs according to class of drug, type of conversion according to class of drug, number of times antibiotics prescribed, effect of switch on hospital stay, per day cost of drugs in INR., total treatment cost [hospital stay * per day bed charges + total treatment (IV or PO) cost].

Inclusion criteria

- Oral fluids/foods are tolerated and no reason to believe that poor oral absorption may be a problem e.g. vomiting, diarrhea.
- Temperature less than 38°C for 24 to 48 hours.
- No signs of sepsis.
- An appropriate oral antibiotic is available.

Exclusion criteria

- Younger than 18 years of age,
- Not eligible for oral formulation based upon a permanent physiologic condition (e.g. malabsorption syndrome, partial or total removal of stomach, or short bowel syndrome),
- Patients with malignancies or admitted to cardiac/intensive care unit.

Data collection:

A structured questionnaire was developed and data were recorded & it was divided into three parts. The first part included demographic characteristics of patients, comorbidities, allergies, primary diagnosis or presumed indication for antibiotic therapy, microbiological results if available. The second included the antibiotics administered, specifying the type, route of administration, duration of IV therapy, and LOS. Additional data were recorded if a switch from the initially prescribed antibiotic was done, this included the time of switch along with the type of modification whether discontinuation or conversion from IV to PO therapy. In the third part, daily recording of signs and symptoms to assess clinical stability throughout the hospital stay.

RESULTS:

In the present study, a total number of 52 patients were evaluated during a period of three months. Out of 52 patients, 33(65.28%) were males and 19(34.61%) were females (Table 1).

Among 52 cases 49(94.23%) were converted & 3(5.76%) were discontinued, which includes exclusion criteria mainly GI disturbance (Table 2).

Among 49 continued subjects mostly Switch 23(44.23%) conversion takes place which is followed by Sequential 8(34.61%) & Step Down by 11(21.15%). (Table 3).

Out of 52 study subjects, 49 subjects met the criteria for continuation of antibiotic treatment in those reasons for continuation were mostly for prophylaxis 25(51.02%), for treatment of documented disease 20(40.81) & for Empirical therapy 4(8.20) (Table 4).

Total of 115 antibiotics were prescribed in our study in which mostly prescribed antibiotics were Cephalosporin 39(33.91%) which were followed by Beta lactamase inhibitor 19(16.52%), Fluoroquinolone 19(16.52%), Aminoglycoside 10(8.69%), Penicillin 6(5.21%), Ureidopenicillin, Oxazolidone & Sulfonamide by the same number resp. 1(0.86%) (Table 5).

According to class wise categorization of drugs total of 63 drugs got converted in which mostly conversion took place in Cephalosporin's 36(57.14%) which was followed by Fluoroquinolones 10(15.87%), Antiprotozoal 8(12.69%), Beta lactamase inhibitor 5(7.93%), Penicillin 4(6.39%). And 31 drugs were not converted which are as follow according to their descending number Beta lactamase inhibitor 11(35.48%), Aminoglycoside 9(29.08%), Antiprotozoal 5(16.12%), Cephalosporin & Fluoroquinolones by the same number of 2(6.45%) (Table 6).

According to class of drug total of 21 switch [cephalosporin's 21(33.33%)], 29 sequential [Cephalosporin 5(7.93%), Fluoroquinolones 9(14.28%), Beta lactamase inhibitor 4(6.34%), Penicillin 4(6.34%), Antiprotozoal 7(11.11%)], And 13 step down [Cephalosporin 9(14.28%), Fluoroquinolones 1(1.58%), β lactamase inhibitor 1(1.58%), Penicillin 1(1.58%), Antiprotozoal 1(1.58%)] conversions took place. (Table 7)

Out of total 966 prescriptions IVs antibiotics were 538 (55.69%) [In which Cephalosporin 280(28.98%), Beta lactamase inhibitor 86(8.90%), Fluoroquinolones 68(7.03%), Penicillin 36 (3.72%), Aminoglycoside 56 (5.79%), Ureidopenicillin 12 (1.24%)] times were prescribed &

Oral antibiotics were prescribed for 428 (44.30%) [In which Cephalosporin 236(24.43%), Fluoroquinolones 70(7.24%), Beta lactamase inhibitor 38(3.93%), Antiprotozoal 38(3.93%), Penicillin 46(4.76%)] times. (Table 8)

Patients were observed from three specific wards in our hospital which were General, Semi special & special ward. In our study IV was prescribed for 4.4(20.91%) days in General, 3.5(16.63%) days in Semi special & 3.5(16.63%) days in Special ward. And Oral antibiotics were prescribed for 3.7(17.58%) days in General, 2.8(13.30%) days in Special & 3.14(14.92%) days in Semi Special ward which shows that with an early switch number of days of hospital stay should be reduced. (Table 9)

In our study, we observed per day total antibiotics cost as Rs. 1988.50, in which total of per day IV cost was Rs. 1842.87(92.67%) which includes per day cost of cephalosporin's Rs. 180.42(9.70%), Fluoroquinolones Rs. 282.66(14.2%), Beta lactamase inhibitors Rs. 241.90(12.16%), Penicillin Rs. 259.60(13.05%), Ureidopenicillin Rs.709(35.65%) Aminoglycoside Rs. 36.38(1.82%), Antiprotozoal Rs. 132.91(6.68%). And total of per day PO cost was 145.63(7.32%) which includes per day cost of cephalosporin's Rs. 31.62(1.59%), Fluoroquinolones Rs. 20.52(1.03%), Beta lactamase inhibitors Rs. 38.65(1.94%), Penicillin Rs.34.84 (1.75%), Antiprotozoal Rs. 20 (1.0%). And the potential cost difference among total IV & total PO is Rs. 1697.24 (85.31%). (Table 10)

Data collected for our study was from General (Rs.100/day), Semi special (Rs.750/day) & special ward (Rs.1500/day), & per day total treatment cost for each department was Rs. 19546.90, in which per day total IV treatment cost was Rs. 12185.01(62.33%), which includes per day treatment cost of General ward Rs. 2282.27(11.67%), Special ward Rs. 7092.87(36.28%) & Semi special ward Rs. 2809.87(14.37%). And per day total PO treatment was Rs. 7361.89(37.62%), which includes per day treatment cost of General Ward Rs. 515.63(2.63%), Special ward Rs. 4345.63(22.23%) & Semi special ward Rs. 2500.63(12.79%). And the potential cost difference among total IV & total PO is Rs. 6413.58 (24.71%). (Table 11)

DISCUSSION:

Intravenous route is generally recommended for patients where oral route is intolerable. However, it is a costly alternative to oral route. The aim of monitoring drug therapy is to minimize the duration of intravenous medication use and switching to the oral dosage form as

soon as clinically feasible. This improves compliance and reduces cost for the patient as well as the service facility. Furthermore, intravenous administration is associated with higher risk of infusion reactions and medical management cost.

And in our study population males were more in number as compared to females which are similar to the study conducted by Zeina M. Shrayteh *et al* [8].

Most of the cases got converted & few were discontinued, the reason for discontinuation mainly includes GI disturbance. Among all the converted cases the type of conversion which took more frequently was switch followed by sequential and very less got converted were step down.

Mostly the prophylaxis was the reason for the continuation of the antibiotic treatment then for the treatment of documented disease, & then for empirical therapy which is deviating to a study conducted by Zeina M. Shrayteh *et al* [8] & Asuman İnan *et al* [9].

Among all prescribed antibiotics, the Cephalosporin's were high in number followed by Beta lactamase inhibitor, then Fluoroquinolones, then Aminoglycoside, then Penicillin, and which were very less includes Ureidopenicillin, Oxazolidone and Sulfonamide.

According to class wise categorization of drugs in our study the class of drugs which were available in both IV & PO & can be converted after the clinical improvement of patients which were in decreasing order according to the numbers of times it got converted, Cephalosporin, Fluoroquinolones, Antiprotozoal, Beta lactamase inhibitor, & Penicillin. And some of drugs which didn't get converted were Beta lactamase inhibitor, Aminoglycoside, Antiprotozoal, Fluoroquinolones & Cephalosporin. And among these all mostly sequential conversion took place which is then followed by switch & then step-down type of conversion.

From total number of antibiotic prescriptions in our study, PO (Cephalosporin, Fluoroquinolones, Penicillin, Beta lactamase inhibitor, & Aminoglycoside) antibiotics were lesser in number than IV (Cephalosporin, Beta lactamase inhibitor, Fluoroquinolones, Aminoglycoside, Penicillin, & Ureidopenicillin) antibiotics.

The acquisition cost of parental antibiotics is always almost greater than that of their corresponding oral counterparts as in our study the Fluoroquinolones, Beta lactamase

inhibitor, Cephalosporin's & Antiprotozoal were expensive as injectables than their oral formulations.

Furthermore, injectables antibiotics were costlier to administer, monitoring may be required and their use means that patients must usually stay in hospital during the course of treatment which often schedule for 7 to 10 days, this later can be extremely expensive e.g. a bed in a special unit. The optimal time to consider switching the patients to oral therapy is after 2 to 4 days of IV therapy according to clinical guidelines, this period of time allows clinician to evaluate the clinical status of patients, our study shows that the maximum IV treatment was given for 4.4 day which is similar to study conducted by Anida C. van Niekerk [3] & then switching it to the oral formulations of the antibiotics maximum for 3.7 days in general ward followed by Special Ward (IV3.5 days & PO 2.8 days), Semi special Ward (IV 3.5 & days PO 3.1 days), which is similar to study conducted by Julio A. Ramirez *et al* [10] & Molyneux EM, Maitland K [11]. Early conversion from IV to PO further reduces the risk of cannula related infection, reduces the hidden cost of diluents, equipment used to administer IV such as needles, syringes & prepare patients for the early discharge which even reduces the per day hospital bed charges & patient can be treated at home these are similar to study conducted by Engel MF *et al* [12].

CONCLUSION

The criteria for switching from IV to oral antibiotics can shorten the duration of IV therapy and reduce treatment costs without any negative influence on the outcome of treatment. The criteria were successfully applied to all patients, independently of the indication (whether empirical or treatment of documented infection & prophylaxis), the underlying disease or the group of antibiotics being used. The setting for our study represents daily medical practice on hospital wards, without direct intervention by ID specialists, thus making it possible to generalize the results.

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CONFLICT OF INTEREST

Authors do not have any conflict of interest.

REFERENCES

1) Mclaughlin CM *et al.* Pharmacy-implemented guidelines on switching from intravenous to oral antibiotics: an intervention study. QJM- An Inte J of Med (2005) 98 (10): 745-752. DOI: 10.1093/qjmed/hci114.
2) Cyriac JM, James E. Switch over from intravenous to oral therapy: A concise overview. Journal of Pharmacology and Pharmacotherapeutics. 2014;5(2):83-87. DOI: 10.4103/0976-500X.130042
3) Niekerk AC, Venter DJ, Boschmans SA. Implementation of intravenous to oral antibiotic switch therapy guidelines in the general medical wards of a tertiary-level hospital in South Africa. J Antimicrob chemother (2012) 67(3): 756-762. DOI: 10.1093/jac/dkr526
4) Nathwani D *et al.* Implementing criteria-based early switch/early discharge programmes: a European perspective. J Clin Microbiol Infect 2015; sep21: S47–S55. DOI: 10.1016/j.cmi.2015.03.023.
5) https://safetyandquality.gov.au/wp-content/uploads/2012/10/Antibiotic-Awareness-Week-2012-Poster-A3-PDF-267KB.pdf.
6) Medication monitoring: Intravenous to oral therapeutic interchange program. Stanford Hospitals and Clinics. Pharmacy Department Policies and Procedures. 5/2012
7) Intravenous to Oral Switch Guideline for Adults Patients – can antibiotics S.T.O.P. Clinical Guideline. SA Health; 17/3/2015. Objective file number 2014-06571.
8) Shrayteh ZM, Rahal MK, Malaeb DN. Practice of switch from intravenous to oral antibiotics, SpringerPlus 2014, 3:717. DOI: 10.1186/2193-1801-3-717.
9) Inan A *et al.* Antibiotic use and cost in a teaching hospital in Istanbul. J Microbiol Infect Dis, 2011; 1 (3): 128-133. DOI: 10.5799/ahinjs.02.2011.03.0029.
10) Ramirez JA, Bordan J. Early switch from intravenous to oral antibiotics in hospitalized patients with bacteremic community- acquired streptococcus pneumoniae pneumonia, Arch Intern Med 2001; 161:848-850. DOI: 10.1001/archinte.161.6.848.
11) Molyneux EM, Maitland K. Intravenous Fluids - Getting the Balance Right. N Engl J Med 2005; 353:941-944. DOI: 10.1056/NEJMe058135.
12) Engel MF *et al.* Barriers to an early switch from intravenous to oral antibiotic therapy in hospitalized patients with CAP, Eur Respir J 2013; Jan 41(1): 123-30. DOI: 10.1183/09031936.00029412

Table 1. Patient Population

Gender	Number of Patients (%)
Male	33(63.46)
Female	19(36.53)
Total	52(99.99)

Table 2. Number of Cases Converted or Discontinued

Category	Number of Cases (%)
Converted	49(94.23)
Discontinued	3(5.76)
Total	52(99.99)

Table 3. Type of Conversion in total cases

Type of Conversion	Numbers (%)
Sequential	18(34.61)
Switch	23(44.23)
Step Down	11(21.15)
Total	52(99.99)

Table 4. Reason for conversion

Reason	No. of cases (%)
Prophylaxis	25(51.02)
Treatment of documented disease	20(40.81)
Empirical	4(8.20)
Total	49(100)

Table 5. Total number of antibiotics

Antibiotic class	Number of Antibiotics (%)
Cephalosporin	39(33.91)
Fluoroquinolone	19(16.52)
Beta lactamase inhibitor	20(17.39)
Penicillin	6(5.21)
Aminoglycoside	10(8.69)
Ureidopenicillin	1(0.86)
Oxazolidone	1(0.86)
Sulfonamide	1(0.86)
Total	115(99.99)

Table 6. Conversion of IV drugs PO drugs according to class of drug

Antibiotic class	Converted (%)	Not Converted (%)
Cephalosporin	36(57.14)	2(6.45)
Fluroquinolone	10(15.87)	2(6.45)
B lactamase inhibitor	5(7.93)	11(35.48)
Penicillin	4(6.39)	0
Aminoglycoside	0	9(29.08)
Antiprotozoal	8(12.69)	5(16.12)
Total	63(99.97)	31(99.97)

Table 7. Type of conversion according to class of drug

Antibiotic class	Type of Conversion		
	Switch (%)	Sequential (%)	Step Down (%)
Cephalosporin	21(33.33)	5(7.93)	9(14.28)
Fluoroquinolones	0	9(14.28)	1 (1.58)
β lactamase inhibitor	0	4(6.34)	1 (1.58)
Penicillin	0	4(6.34)	1 (1.58)
Antiprotozoal	0	7(11.11)	1 (1.58)
Total	21(33.33)	29(46)	13(20.6)

Table 8. Number of times Antibiotics prescribed

Antibiotic class	IV (%)	PO (%)	IV+PO (%)
Cephalosporin	280 (28.98)	236 (24.43)	516 (53.41)
Fluoroquinolones	68 (7.03)	70 (7.24)	138(14.28)
B lactamase inhibitor	86 (8.90)	38 (3.93)	124 (12.83)
Penicillin	36 (3.72)	46 (4.76)	82 (8.48)
Uredopenicillin	12 (1.24)	0	12 (1.24)
Antiprotozoal	56 (5.79)	38 (3.93)	94 (9.73)
Total	538 (55.69)	428 (44.30)	966 (99.97)

Table 9. Effect of Switch on Hospital stay

Departments	Number of Days		
	IV (%)	PO (%)	Total (%)
General Ward	4.4(20.91)	3.7(17.58)	8.1(38.49)
Special Ward	3.5(16.63)	2.8(13.30)	6.3(29.94)
Semi special Ward	3.5(16.63)	3.1(14.92)	6.64(31.55)

Table 10. Per day cost of Drugs in INR.

Antibiotic class	IV (%)	PO (%)	Total Cost IV+PO (%)	Potential Cost difference IV-PO (%)
Cephalosporin	180.42 (9.70)	31.62 (1.59)	212.04 (10.66)	148.8 (8.11)
Fluoroquinolones	282.66 (14.21)	20.52 (1.03)	303.18(15.24)	262.14(13.18)
B lactamase inhibitor	241.90 (12.16)	38.65 (1.94)	280.55 (14.108)	203.25 (10.22)
Penicillin	259.6 (13.05)	34.84 (1.75)	294.44 (14.80)	224.76 (11.30)
Uredopenicillin	709 (35.65)	0	709 (35.65)	709 (35.65)
Aminoglycoside	36.38 (1.82)	0	36.38 (1.82)	36.38 (1.82)
Antiprotozoal	132.91(6.68)	20(1.0)	152.91(7.68)	112.91(5.68)
Total	1842.87 (92.67)	145.63 (7.32)	1988.5 (99.99)	1697.24 (85.31)

Table 11. Total Treatment Cost [Hospital stay * per day bed charges + total treatment (IV/PO) cost]

Departments	Total Treatment Cost (Rs.)= [Hospital stay * per day bed charges + total treatment (IV/PO) cost]			
	IV (%)	PO (%)	Total Cost IV+PO (%)	Potential Cost difference IV-PO
General Ward (Rs. 100/day)	2282.27(11.67)	515.63(2.63)	2797.90(14.30)	1766.64(9.04)
Special Ward (Rs.1500/day)	7092.87(36.28)	4345.63(22.23)	11438.50(58.51)	4337.70(14.04)
Semi special Ward (Rs.750/day)	2809.87(14.37)	2500.63(12.79)	5310.50(27.16)	309.24(1.58)
Total	12185.01(62.33)	7361.89(37.62)	19546.90(99.99)	6413.58(24.71)