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Multi-Disciplinary Approach and Need of Intravenous to Oral Conversion in Hospital and Role of the Pharmacist in Rational Use of Antimicrobials

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ABSTRACT

Multi-disciplinary approach and IV to oral conversion are important aspects of rational use of antimicrobials in hospitals. Most of the time patients admitted to the hospital with any serious condition are first given an intra venous route of administration. Some of patient will continue with IV where as some will be converted to oral administration. The shift from iv to oral depends on disease severity, co-morbidity, and drug bioavailability. Body weight-based conversion of intravenous to oral should be practiced for effective and tolerable treatment and for good therapeutic outcome. But this conversion from IV to oral is not applicable in all patients whose GI absorption is altered. IV administration is mostly effective in highly infected patient and in septicemic for their early recovery. But long-term iv administration leads to iv abuse that includes phlebitis, infiltration, hematoma. Prolonged iv administration of psychotropic drugs like Carbamazepine leads to sleep abnormalities, decreased gait, anxiety disorders. Nowadays irrational use of IV antibiotics is increasing, hence to avoid irrational use of antibiotics IV should be converted to oral at proper time and guidelines. Role of clinical pharmacist in switching IV to oral includes monitoring, educating and practicing as per the guidelines.

INTRODUCTION

Any medications, best route of administration is the one that reaches serum concentration and produces its therapeutic effect. Majority of physicians prefer intravenous administration considering their bioavailability and disease condition. They usually begin with IV and then switch to oral administration after 3-4 days, which is known as Switch therapy or sequential antibiotic therapy [1]. According to a retrospective study conducted in a Brazilian hospital ICU in sepsis patients receiving antibiotics from January 2016 to March 2018, it was concluded that ASP intervention in oral switch in sepsis patient reduced the ICU stay and patient was clinically stable. Switch therapy reduced costs and length of stay in ICU, and that this strategy is safe for critically ill patients. According to this study, hospitalized patients after 72 hours of initial stabilization, nearly 83 percent of patients will be receiving IV antibiotics unnecessarily, and treatment charges increased by 200 percent [2]. Some classes of antimicrobial such as quinolones(levofloxacin), have oral bioavailability similar to IV administration, even when administered to critically ill patients. Orally administered levofloxacin appears to be well absorbed in selected ICU patients and has pharmacokinetics similar to those of intravenously administered levofloxacin [3]. There are three different types of conversion of intravenous to oral namely sequential, step-down and switch. A sequential therapy means replacing parenteral version to its oral counterpart; a switch therapy means converting with the same potency and this may be of same class; and a step-down therapy means conversion injectable medication to an oral form which may of another class or of same class with a lower potency. Clinical pharmacist with help of infectious disease team play important role in sensible antibiotic use for the safety of patients [4]. In a case study conducted at University of California San Diego medical center, 36-year-old female patient was presented with a previous history of metastatic breast cancer with dyspnea with worsening back pain with a pain score of 10/10. As her pain was not subsided with oral morphine equivalents, a body weight based intravenous ketamine was given then later equivalent oral ketamine dose was given and her pain continued to be well managed with average pain score of 5/10. [5] A body weight based prior dose calculation should be done before converting Intravenous to oral to have a therapeutic efficacy and tolerability. PVP deposition due to continues usage of intravenous opioid will lead to multi organ failure and cachexia.[6] Contents and composition of intravenous medications should be reviewed to avoid excipient induced toxicity in case of prolonged use of intravenous medications.

***Guidelines for IV to oral switch**:*

1. Criteria for considering IV to oral switch:

- Antibiotic treatment indicated.

- Oral fluids/foods are tolerated and no reason to believe that poor oral absorption may be a problem (e.g. vomiting, diarrhea, short gut syndrome, active gastro-intestinal bleeding).

- Temperature less than 37.5°C for 24 to 48 hours. [7]

2. Timely conversion from IV to oral antimicrobial therapy is effective for a variety of infections. [8]

3. The majority of patients presenting with a severe infection who require IV therapy initially can be switched to oral therapy after 24-48 hours provided that they are improving clinically and can tolerate an oral formulation. [9]

4. Short intravenous course of therapy for 2-3 days followed by oral medications for the remainder of the course is found to be beneficial to many patients. [10]

5. Hospitalized patients initially on intravenous antibiotics can be safely switched to an oral equivalent within the third day of admission once clinical improvement is observed.

6. IV to oral switch therapy is NOT appropriate in critically ill patients who require IV antimicrobials. [9]

7. Benefits of early switch:

- Reduction in the likelihood of hospital-acquired bacteremia, and infected/phlebitic IV lines.

- Patient is more likely to receive antibiotics at the correct time and miss fewer doses.

- Potential reduction in the risk of adverse effects; errors in preparation are significantly higher with parenteral drugs, compared to oral formulations.

- Reduces patient discomfort and enables improved mobility and the possibility of earlier discharge from the hospital.

- Saves both medical and nursing time.

- Potential reduction in treatment costs allowing finances to be better spent elsewhere. [9]

8. Antibiotics, gastrointestinal agents (mainly proton pump inhibitors and histamine-2 antagonists), and antifungals are major medication classes that can be utilized in IV to oral switch over. [10]

It is important to note that these guidelines are general in nature and may vary depending on the specific patient and clinical situation.

ADVANTAGES OF PO OVER IV:

- Reduced risk of catheter associated infection, increased patient comfort and mobility, possibility of early discharge, less labour intensive for nursing staff, and clear economic benefits.

- Reduced risk of bacteremia, decreased incidence of thrombophlebitis, and less patient inconvenience. [1, 2, 4].

- Sequential fluoroquinolone therapy has the advantage of increased potency, and using the same drug makes physician acceptance of early iv/po conversion easier. Conversion from intravenous to oral therapy was accomplished more quickly when converting to the same agent with pharmacist initiated automatic iv/po conversion, thus reducing the associated cost without compromising efficacy. [5]

DISADVANTAGE

- Oral therapy is usually not practicable in cases of meningitis, Intracranial abscess, endocarditis, legionella pneumonia, and exacerbation of cystic fibrosis, severe soft tissue infections.

- Oral therapy is not preferable for severe infections during chemotherapy related to severe neutropenia. [1, 4]

IV TO ORAL SWITCH

To determine the appropriate oral antibiotic dose after the IV to oral switch, the following steps can be taken:

Assess the patient: Patients initiated on IV antimicrobials should be assessed for conversion to oral antibiotics. [11]

The majority of patients presenting with a severe infection who require IV therapy initially can be switched to oral therapy after 24-48 hours provided that they are improving clinically and can tolerate an oral formulation. [12]

Choose the appropriate antibiotic: Antibiotics ideal for IV-to-PO switch programs include chloramphenicol, clindamycin, metronidazole, trimethoprim, and linezolid. Linezolid is a useful antibiotic in IV to oral switch. Approximately 40-50% of patients admitted for intravenous antibiotics can be switched to oral antibiotics within 2-3 days. [10]

Once the culture and sensitivity reports are available, IV to oral switch over enables one to select a cheaper or older antibiotic, which is as effective. [13]

Monitor the patient: The therapeutic application of IV to oral switch over for Community Acquired Pneumonia is about 40-60% of patients admitted, and vital signs and WBC should be monitored before conversion from IV to oral therapy. Fluoroquinolones are the first line. [13]

Explicit physiological criteria must be recorded. [12]

Consider the patient's condition: IV to oral switch therapy is NOT appropriate in critically ill patients who require IV antimicrobials or in patients unable to absorb drugs after oral administration. [11]

Follow guidelines: Guidelines can help doctors make the proper decision to do the switch in appropriate patients. [12]

. The IV to Oral Switch Clinical Guideline for adult patients: Can antibiotics STOP - SA Health provides recommendations for the appropriate and timely switching of intravenous antimicrobials to an oral equivalent. [13]

Consider cost: A study showed that the average cost of antibiotics and the length of stay of patients could be reduced due to early switch over from parenteral to oral therapy. [13]

ANTIMICROBIAL STEWARDSHIP PROGRAM STRATEGIES

Goal of ASP is to prevent or decrease the resistance of antimicrobial, correct drug selection, maximum clinical outcome, decreased duration of treatment, cost and reduce adverse effects of antibiotics due to long term use and decrease toxicity. Rational antibiotic prescribing pattern and ASP is beneficial for patient in reducing health care spending. [14].

Strategies of ASP are divided into 2 types: Prospective audit and feedback strategies and Prior-authorization strategies [14].

Prospective audit with intervention and feedback: This process means it is an ongoing prescription audit where clinical pharmacist or an infectious disease physician directly communicates and provides adequate response to the prescriber. With the help of literature and quality evidences, pharmacist helps in reducing irrational use of antibiotics. Prescriber further makes an intervention and provides feedback. [15]

Formulary restriction and pre-authorization: This process helps significantly in reducing antibiotics use and cost, and also, they are useful as part of a mixed response to a nosocomial infection outbreak. The need for preauthorization is less clear in maintaining antibiotic resistance due to long-term beneficial impact on resistance is not been established yet, and in some cases, use may be simply shift to alternative agent, leading to increased resistance. Monitoring altogether antimicrobial usage is needed in organizations that uses preauthorization to decrease the use of selected antimicrobial in order to evaluate and respond to such shifts in use.[15]

An associative antimicrobial stewardship team should include a physician of infectious diseases and a clinical pharmacist with infectious diseases training, who should be reimbursed for their time, as well as a clinical microbiologist, specialist of information system, an infection control professional, and a hospital epidemiologist.

The clinical pharmacist should be well-learned about the rational usage of antimicrobials, recent guidelines, and proper training should be furnished to achieve and maintain the knowledge.[15]

-Creating and applying ASPs can be a remarkable challenge for community-based hospitals. Aside from specific and localized patterns of resistance, community hospitals must develop strategies that confirm their size, staffing, personnel, and infrastructure.[14]

ANTIMICROBIAL STEWARDSHIP STRATEGIES IN CONVERTING IV TO ORAL

There are several ways to encourage the use of oral agents when possible:

Policies and guidelines to automatically switch to an appropriate oral agent when certain criteria are met. These automatic substitution policies are typically used for highly bioavailable agents.

When patients meet specific clinical parameters, they may be transitioned to oral therapy in consultation with their prescriber.

Chart reminders can be used to notify a prescriber when a patient meets certain criteria.

Many hospitals have developed methods for flagging patients who may be candidates for IV to PO conversion for review. This may include clinical pharmacists manually reviewing patient profiles generated by pharmacy computer systems or clinical decision support systems.

If the programme is led by a pharmacist or a nurse, approval from the pharmacy and therapeutics committees would be required.[16]

According to the study conducted at Brigham and Women's hospital, in this hospital all the medications are ordered through online, and according to this study computer reminders resulted in decreased use of targeted iv medication. Nowadays these online prescribing has become more common therefore this type of reminders can be useful in reducing over usage and irrational uses of intravenous medications, this can help in improvement in outcome, patient comfort, safety, as well as cost. In this study drugs like fluconazole, amiodarone, levofloxacin, metronidazole and ranitidine were chosen because the bioavailability of this when given iv are equal to oral. The computer used order entry was used in hospital by physicians in converting iv to oral route.[17]

According to the research conducted by Shu-Chean Chien, the study result indicated that single dose of levofloxacin 500mg given orally or intravenously was well tolerated by the study subjects and pharmacokinetics was linear and predictable for single and multiple dose [18].

ROLES AND RESPONSIBILITIES OF CLINICAL PHARMACIST IN CONVERSION OF IV TO ORAL FORM

The main responsibility of the clinical pharmacist in conversion of iv to oral is to prepare a standard guideline in hospital with the approval of Pharmacy and Therapeutics guideline and should make sure the hospital is working according to this guideline.

Primarily the clinical pharmacist should monitor and look over patients who are been given with intravenous medication and then should investigate requirement for the iv form.

Secondarily clinical pharmacist should do regular follow up to see whether the disease condition is improving and should check patient's WBC, vitals, culture report and should see whether patients are fit physically and mentally.

Cross check the patients those who have converted and inform physician those who are fit for conversion but still dint convert yet in proper time.

Give acceptable advice for the selection of antibiotics to be converted to oral.

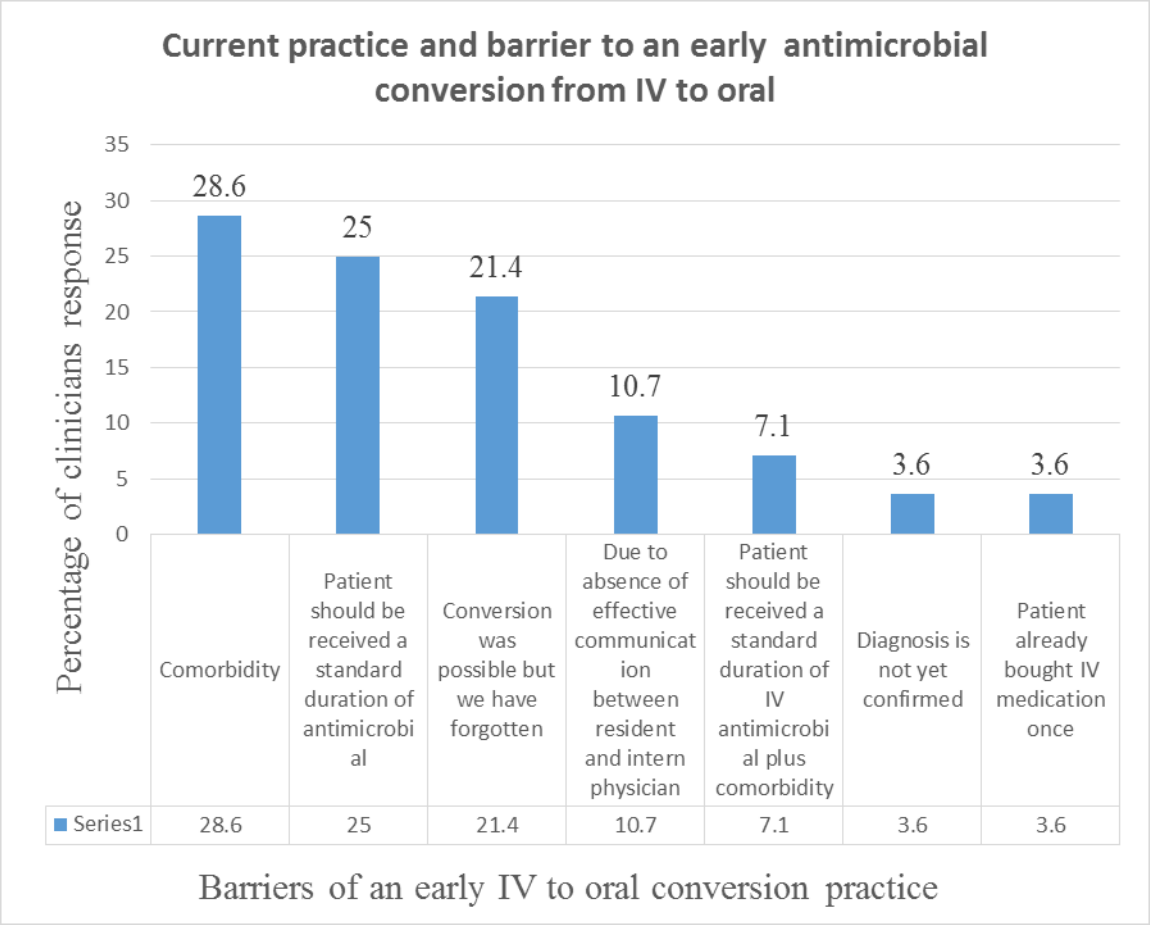
Check patient development of health after converting to oral, if there is no improvement convert back to iv form.

It is superior to check the knowledge and confidence of physicians in converting from intravenous to oral therapy. Questionnaires can be used to collect patient data.[10]

Criteria for patients in conversion from intravenous to oral switch over [10]

Inclusion criteria	Exclusion criteria
-If patient is capable to have food through oral. -If patient has no problem in Gastro-intestinal tract. -If bioavailability and absorption of drug is equal to oral part comparing to its parenteral form - If patient is receiving other medication through oral. -After taking oral antibiotics if the sign and symptoms and patient health are improving while monitoring parameters.	- Patients with inaccurate response to oral medications (severe nausea and vomiting) -Unable to swallow or if patient unconscious. -Stern (NPO) for a procedure. - in case gastro intestinal block, malabsorption, GI bleeding, pseudo-obstruction or severe diarrhea oral form is not applicable. -No response to earlier oral therapy, - Patients with grade 3 or 4 muco-cytosis. - Mainly in disease conditions like meningitis, infective carditis, osteomyelitis, sepsis, severe cellulitis, bronchiectasis, pneumonia with AIDS, oral therapy is not suitable. -Epilepsy and probability of aspiration. -Decreased blood pressure or shock. -Oral therapy is not useful in immuno-compromised patient (febrile neutropenia, malignancy treatment, post-transplant, functional asplenia) - Patient is in IV antibiotics for less than 24hours in pseudomonal infection.

Barriers of an advance antimicrobial conversion from IV to oral form [19]



According to the study conducted in Jimma University Specialized Hospital, conversion from IV to oral of antibiotics was unnecessarily made late in moderate to severe infection due to a variety of different barriers. Addressing these issues has the potential to reduce antimicrobial misuse and resistance.[19]

CONCLUSION

As a Clinical Pharmacist there is a huge role in conversion of IV to oral. Before converting we should check the "medical records" and identify the patients who are suitable and eligible for conversion. Nowadays antibiotics are simply provided through IV route where there is no necessary which might lead to resistance or adverse effect. According to WHO, rational drug use means patients receiving medications at a given time with appropriate doses at the lowest cost. Hence to follow this unnecessary antibiotic usage and IV administration should be minimized according to the patient health condition. A multi-disciplinary approach involving clinical pharmacists and other healthcare professionals can help optimize antimicrobial use in hospitals. IV to oral conversion is an important aspect of antimicrobial stewardship that can

help reduce the duration of IV therapy and minimize the risk of complications associated with IV use. Clinical pharmacists play a key role in IV to oral conversion and can help assess patients for conversion to oral antibiotics. Guidelines have been developed to promote standardization and consistency of practice for IV to oral switch.

Ethical approval – Not required

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