An in-depth study of drugs prescribing pattern in the Surgery Department of a Tertiary Care Teaching Institute in Northern India

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INTRODUCTION

A prescription is a written advice that mentions drugs and other instructions given to either pharmacist or chemist to dispense the drugs to the patients for proper treatment of the disease.1-3 It provides information like an adequate dose of the drug to be given, its duration and the way it has to be taken.2,3 If a drug is prescribed in a rational way, it will help us in reducing the patient’s expenditure, lower adverse drug reactions, drug interactions and extra burden on medical as well as paramedical staff.1,4,5 Therefore, prescription audit/monitoring or drug utilization study should be done periodically to increase the therapeutic efficacy, decrease the adverse effects and provide feedback to the prescriber to ensure rational use of medicines.6,7

There is a specific format for prescription and World Health Organization (WHO) has given a list of prescribing indicators to analyze the drugs prescribing pattern.4

ABSTRACT

Background: In surgical patients, a number of drugs are prescribed to prevent post-operative infections and to relieve pain. Therefore, prescription audit should be periodically performed in Department of Surgery to analyze the present scenario of drugs prescribed for the surgical/post-operative patients. This will help us to use the medicines rationally and decrease the adverse effects in surgical patients. The main aim of the study was to evaluate the drugs prescribing pattern in the Surgery Department in Tertiary Care Teaching Institute.

Methods: Patients’ prescriptions or case record forms were randomly collected over a period of 1 year from the Department of Surgery at GGS Medical College and Hospital, Faridkot, Punjab (India) for analysis and rationalization.

Results: A total of 900 prescriptions was collected and analyzed for drugs used in surgical patients. Average number of drugs prescribed is 4.26. The most commonly prescribed drugs were anti-microbial agents (AMAs), gastrointestinal tract (GIT) related, non-steroidal anti-inflammatory drugs (NSAIDs) and multivitamins and trace elements, and their percentages were 37.90%, 23.36%, 14.14 %, and 9.11% respectively. About 95% drugs were prescribed by non-generic (Trade) names. Drugs prescribed from National Essential Medicines List (EML) and World Health Organization EML were 69.25% and 45.31% respectively. Average cost per prescription per day was Rs. 610/- (INR) or $10.34 USD in a surgical patient.

Conclusions: There is a high tendency and frequency to prescribe four and more than four drugs to post-operative patients. Most drugs prescribed were AMAs, GIT related, NSAIDs and Multivitamins and trace elements. There is an urgent need to develop proper prescription writing skills in budding doctors regarding the use of EML/drugs list and generic medicines to reduce the cost of treatment.

Keywords: Prescription audit, Prescribing indicators, Essential medicines list, Anti-microbial agents, Post-operative patient, Generic medicines

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Received: 26 May 2014
Revised: 12 June 2014
Accepted: 25 June 2014

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The current study was done to evaluate the drugs prescribing pattern in the Department of Surgery in a Tertiary care teaching Institute at Faridkot (Punjab).

**METHODS**

This was a cross-sectional hospital based descriptive study. Patients’ prescription slips or physicians’ order sheet of the hospital record (case record forms [CRFs]) were randomly collected from the patients visiting the outpatient departments (OPDs) or admitted in the ward of Surgery Department, Guru Gobind Singh Hospital attached to the GGS Medical College, Faridkot over a period of 1 year (April 2013 to April 2014) (Figure 1). The relevant information was entered into the pretested proforma (containing name, age, sex, diagnosis, ongoing treatment as recorded from patients’ prescription slips or CRFs) and analyzed for prescribing indicators (as per WHO guidelines).4 These prescribing indicators are:4

1. Average number of drugs per prescription (encounter)
2. Percentage of drugs prescribed by generic name
3. Percentage of encounters for antibiotic prescriptions
4. Percentage of encounters for prescribing injections
5. Percentage of drugs prescribed from an essential medicines list (EML)/drugs list
6. Average drug cost per prescription or encounter.

Necessary permission was granted by the Institutional Ethical Committee and written informed consent was obtained from the patients prior to collecting their prescription slips/CRFs.

**Inclusion criteria**

Patients of either sex over 14 years of age, patients who had been through a surgery, patients with co-morbid condition, patients undergoing re-operation and patients visiting the OPD after surgery (day care surgery) were included in the study.

**Figure 1: Study design.**

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**Prescriptions were analyzed for WHO- Prescribing Indicators as below:**

1. Average number of drugs per prescription (encounter)
2. Percentage of drugs prescribed by generic name
3. Percentage of encounters for antibiotic prescriptions
4. Percentage of encounters for prescribing injections
5. Percentage of drugs prescribed from an Essential Medicines List/Drugs List (EML)
6. Average drugs cost per prescription or encounter.

**Other parameters:** Percentage of other drugs viz. NSAIDs, GIT related, Multivitamins & trace elements, etc., were also analyzed.
Exclusion criteria

Patients who were below 14 years of age, pregnant and lactating women, cancer patients who were on chemotherapy and outpatients with minor ailments were excluded.

RESULTS

A total of 900 prescriptions/CRFs was collected that contained 3840 drugs. Males were 61.77% and females were 38.33%, respectively. There were patients who had undergone surgical procedures of different diseases like GIT (31.66%), kidney urinary bladder (13.67%), followed by cancer (11.44%), other miscellaneous disorders (11.44%), traumatic injuries (16.44) and undiagnosed contributed (4.1%), respectively (Table 1).

Average number of drugs prescribed was 4.26 and most commonly prescribed number of drugs was 4 (24.67%) and 5 (23.33%) as per prescription (Table 2).

The most commonly drugs prescribed were antimicrobials, GIT related, NSAIDs, vitamins/minerals and central nervous system related drugs and their percentage was 37.90%, 23.36%, 14.14%, 9.11% and 2.66%, respectively. About 11.14% drugs involved various intravenous (IV) fluids. About 94.75% drugs were prescribed by non-generic (Trade) name (Table 3).

Fixed-dose combinations (FDCs) were given by 14.19% (n=477). Commonly prescribed FDCs were multivitamins (50.31%, n=240), AMAs (antimicrobials agents) (33.96%, n=162) and NSAIDs (15.72%, n=75) among FDCs group.

DISCUSSION

Prescribing indicators

Average number of drugs prescribed (4.26) (Table 2) was less as disclosed by Bhansali et al. (5.70) and Sharma et al. (5.45). Number of drugs prescribed per encounter (4/prescription, 24.67%) less as revealed by Bhansali et al. (8/prescription, 19.58%).

Total AMAs prescribed (37.89%) (Table 2) was more than as revealed by Bhansali et al. (16.16%) and Shankar et al. (21.1%). Commonest group of AMAs prescribed was cephalosporin (40.99%) (Table 4) that was less as revealed by Bhansali et al. (74.73%) and more than Sharma et al. (34%) but comparable to Parveen et al. (44.5%) respectively. Among cephalosporin, cefuroxime (17.17%) (Table 4) was commonly prescribed in this study, while other studies disclosed use of ceftriaxone (64.66% and 23.77% respectively) in surgical patients.

Aminoglycosides (14.70%) (Table 4) prescribed was less as revealed by Bhansali et al. (25.26%) and Sharma et al. (26%) but comparable to Parveen et al. (15%). Among aminoglycosides amikacin (13.73%) was prescribed less than as observed by Bhansali et al. (25.16%) and Sharma et al. (26%) respectively.

Fluoroquinolones (5.58%) (Table 4) prescribed was less as observed by Sharma et al. (12%) but more than Parveen et al. (2%). In this study, ofloxacin was most frequently prescribed while ciprofloxacin and levofloxacin were observed by Sharma et al.

Table 1: Morbidity patterns in surgical patients.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>900</td>
<td>100</td>
</tr>
<tr>
<td>GIT related diseases</td>
<td>285</td>
<td>31.67</td>
</tr>
<tr>
<td>Gall bladder</td>
<td>132</td>
<td>14.70</td>
</tr>
<tr>
<td>Cholelithiasis</td>
<td>112</td>
<td>12.44</td>
</tr>
<tr>
<td>Cholecystitis</td>
<td>30</td>
<td>3.35</td>
</tr>
<tr>
<td>Acute appendicitis</td>
<td>31</td>
<td>3.44</td>
</tr>
<tr>
<td>Acute pancreatitis</td>
<td>14</td>
<td>1.55</td>
</tr>
<tr>
<td>Intestinal obstruction</td>
<td>35</td>
<td>3.89</td>
</tr>
<tr>
<td>Intestinal perforation</td>
<td>10</td>
<td>1.11</td>
</tr>
<tr>
<td>Rectum/anal diseases</td>
<td>21</td>
<td>2.33</td>
</tr>
<tr>
<td>Hernia</td>
<td>42</td>
<td>4.67</td>
</tr>
<tr>
<td>Inguinal hernia</td>
<td>27</td>
<td>3.00</td>
</tr>
<tr>
<td>Umbilical hernia</td>
<td>15</td>
<td>1.67</td>
</tr>
<tr>
<td>Varicocele/hydrocele</td>
<td>14</td>
<td>1.55</td>
</tr>
<tr>
<td>KUB</td>
<td>123</td>
<td>13.67</td>
</tr>
<tr>
<td>Renal calculi</td>
<td>54</td>
<td>6.00</td>
</tr>
<tr>
<td>Renal cyst</td>
<td>12</td>
<td>1.33</td>
</tr>
<tr>
<td>BPH</td>
<td>21</td>
<td>2.33</td>
</tr>
<tr>
<td>Urethral stricture</td>
<td>33</td>
<td>3.67</td>
</tr>
<tr>
<td>UTI</td>
<td>3</td>
<td>0.33</td>
</tr>
<tr>
<td>Traumatic injuries</td>
<td>145</td>
<td>16.44</td>
</tr>
<tr>
<td>Road side accident with head injury</td>
<td>57</td>
<td>6.33</td>
</tr>
<tr>
<td>Other trauma</td>
<td>91</td>
<td>10.11</td>
</tr>
<tr>
<td>Diabetes mellitus with complications</td>
<td>32</td>
<td>3.67</td>
</tr>
<tr>
<td>Burn</td>
<td>27</td>
<td>3.00</td>
</tr>
<tr>
<td>Cancers</td>
<td>103</td>
<td>11.44</td>
</tr>
<tr>
<td>Cancer breast surgery</td>
<td>35</td>
<td>3.89</td>
</tr>
<tr>
<td>Cancer other organs (esophagus, stomach, prostate, anus, rectum, prostate, urinary bladder, gall bladder, liver, cervix)</td>
<td>33</td>
<td>3.67</td>
</tr>
<tr>
<td>Thyroid diseases, salivary glands, lipoma, splenic cyst, abscess, benign lump, neck swellings, intestinal tuberculosis, etc.</td>
<td>103</td>
<td>11.44</td>
</tr>
<tr>
<td>Undiagnosed</td>
<td>37</td>
<td>4.1</td>
</tr>
</tbody>
</table>

GIT: Gastrointestinal tract, KUB: Kidney urinary bladder, BPH: Benign prostatic hyperplasia, UTI: Urinary tract infection
Nitroimidazoles (5.36%) (Table 4) prescribe was less as revealed by Sharma et al. (12%)\textsuperscript{9} and Parveen et al. (30.7%).\textsuperscript{11} Commonly prescribed was metronidazole among nitroimidazoles (8.8%), which was less as revealed by Parveen et al. (30.7%).\textsuperscript{11}

FDCs of fluoroquinolones with nitroimidazoles was frequently prescribed (5.36%) (Table 4) but other studies\textsuperscript{8-11} did not mention about them.

Total FDCs of AMAs was prescribed by 11.45% (Table 4) that is less as disclosed by Parveen et al. (18.84%).\textsuperscript{11} These combinations include beta-lactam with penicillinase inhibitors (20.17%, n=282), while rest was fluoroquinolones with nitroimidazoles (5.36%). FDCs of amoxicillin with clavulanic acid (37.81%) and tazobactam with piperacillin (16.80%) were more as revealed by Parveen et al. (23.4% and 11.11% respectively).\textsuperscript{11} During FDCs of ceftriaxone with sulbactam (9.24%) was also prescribed in this study, while other study showed cefoperazone with sulbactam (37%)

<table>
<thead>
<tr>
<th>Number of drug prescribed in a prescription</th>
<th>Number of encounters</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>1.33</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>162</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>222</td>
<td>24.67</td>
</tr>
<tr>
<td>5</td>
<td>210</td>
<td>23.33</td>
</tr>
<tr>
<td>6</td>
<td>147</td>
<td>16.33</td>
</tr>
<tr>
<td>7</td>
<td>54</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>21</td>
<td>2.33</td>
</tr>
<tr>
<td>&gt;9</td>
<td>27</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2: Number of drugs prescribed per encounter.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Total N</th>
<th>Percentage within the group</th>
<th>Percentage out of total drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescription</td>
<td>900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total drugs</td>
<td>3840</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMA</td>
<td>1398</td>
<td>37.9</td>
<td></td>
</tr>
<tr>
<td>GIT related</td>
<td>897</td>
<td>23.36</td>
<td></td>
</tr>
<tr>
<td>Pantoprazole</td>
<td>507</td>
<td>56.52</td>
<td></td>
</tr>
<tr>
<td>Omperazol</td>
<td>15</td>
<td>1.67</td>
<td></td>
</tr>
<tr>
<td>Rabeprazole</td>
<td>18</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Ranitidine</td>
<td>51</td>
<td>5.69</td>
<td></td>
</tr>
<tr>
<td>Antispasmodic</td>
<td>39</td>
<td>4.35</td>
<td></td>
</tr>
<tr>
<td>Antiemetics (domperidone, ondansetron, metoclopramide)</td>
<td>87</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>Antacids</td>
<td>180</td>
<td>20.01</td>
<td></td>
</tr>
<tr>
<td>NSAIDs</td>
<td>543</td>
<td>14.14</td>
<td></td>
</tr>
<tr>
<td>Diclofenac</td>
<td>429</td>
<td>80.0</td>
<td></td>
</tr>
<tr>
<td>Paracetamol</td>
<td>30</td>
<td>5.61</td>
<td></td>
</tr>
<tr>
<td>Diclofenac+Serratiopeptidase</td>
<td>66</td>
<td>12.36</td>
<td></td>
</tr>
<tr>
<td>Ibuprofen+Paracetamol</td>
<td>09</td>
<td>1.68</td>
<td></td>
</tr>
<tr>
<td>Tetanus toxoid (injection)</td>
<td>54</td>
<td>1.41</td>
<td></td>
</tr>
<tr>
<td>Vitamins and trace elements</td>
<td>350</td>
<td>9.11</td>
<td></td>
</tr>
<tr>
<td>Vitamin C</td>
<td>14</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>B-complex</td>
<td>240</td>
<td>68.57</td>
<td></td>
</tr>
<tr>
<td>Vitamin K</td>
<td>36</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>60</td>
<td>17.14</td>
<td></td>
</tr>
<tr>
<td>CNS related</td>
<td>102</td>
<td>2.66</td>
<td></td>
</tr>
<tr>
<td>Opioids/tramadol</td>
<td>33</td>
<td>32.35</td>
<td></td>
</tr>
<tr>
<td>Phenytoin</td>
<td>15</td>
<td>14.71</td>
<td></td>
</tr>
<tr>
<td>Piracetam</td>
<td>54</td>
<td>52.94</td>
<td></td>
</tr>
<tr>
<td>Mannitol</td>
<td>30</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>Intravenous fluids (ringer lactate, dextrose, dextrose saline, etc.)</td>
<td>428</td>
<td>11.14</td>
<td></td>
</tr>
<tr>
<td>Drug prescribed by generic name</td>
<td>192</td>
<td>5.25</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Drugs commonly used in surgical patients.

AMAs: Anti-microbial agents, GIT: Gastrointestinal tract, NSAIDs: Non-steroidal anti-inflammatory drugs, CNS: Central nervous system.
Table 4: AMA commonly prescribed.

<table>
<thead>
<tr>
<th>AMAs</th>
<th>N</th>
<th>Percentage</th>
<th>Percentage of total AMAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMAs</td>
<td>1398</td>
<td>36.41</td>
<td>55.01</td>
</tr>
<tr>
<td>Beta lactam</td>
<td>55</td>
<td>1.72</td>
<td></td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>240</td>
<td>7.17</td>
<td></td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>60</td>
<td>1.72</td>
<td></td>
</tr>
<tr>
<td>Cefixime</td>
<td>12</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>33</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>Cef Tribe</td>
<td>69</td>
<td>1.94</td>
<td></td>
</tr>
<tr>
<td>Tazobactam+Piperacillin</td>
<td>60</td>
<td>1.72</td>
<td></td>
</tr>
<tr>
<td>Cef Tribe+Sulbactam</td>
<td>33</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>Cef Tribe+Tazobactam</td>
<td>27</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>Ampicillin+Sulbactam</td>
<td>27</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>Amoxicillin+Clavulanic acid</td>
<td>135</td>
<td>3.96</td>
<td></td>
</tr>
<tr>
<td>Aminoglycosides</td>
<td>204</td>
<td>5.62</td>
<td></td>
</tr>
<tr>
<td>Amikacin</td>
<td>192</td>
<td>5.52</td>
<td></td>
</tr>
<tr>
<td>Genatmicin</td>
<td>12</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Kanamycin</td>
<td>9</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>Vancomycin</td>
<td>12</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Nitroimidazoles-metronidazol</td>
<td>123</td>
<td>3.46</td>
<td></td>
</tr>
<tr>
<td>Ofloxacin+Ornidazole</td>
<td>75</td>
<td>2.15</td>
<td></td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td>78</td>
<td>2.15</td>
<td></td>
</tr>
<tr>
<td>Ofloxacin</td>
<td>66</td>
<td>1.86</td>
<td></td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>12</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Others AMAs</td>
<td>111</td>
<td>3.02</td>
<td></td>
</tr>
<tr>
<td>Povidone iodine</td>
<td>116</td>
<td>3.16</td>
<td></td>
</tr>
</tbody>
</table>

AMAs: Anti-microbial agents

(Sharma et al.). Among other FDC’s combination ofloxacin with the ornidazole (21%) was commonly prescribed while other studies did not mention about such combination.

Average number of antibiotics (1.55) in the prescription was less as revealed by Bhansali et al. (2.95) and Parveen et al. (3.92). GIT-related drugs prescribed (by 23.36%) (Table 3) were more than as disclosed by Bhansali et al. (13.2%) and Shankar et al. (9.5%) respectively. The most common anti-ulcer drugs prescribed were pantoprazole (52.98%) and antacids (18.80%). Anti-ulcer drugs more frequently prescribed were pantoprazole (a proton pump inhibitor) and ranitidine (antihistaminic - H2 blocker). In this study, ranitidine prescribed (5.69%) was less as observed by Bhansali et al. (6.4%) and Shankar et al. (6.4%) respectively in post-operative patients. Antiemetics viz. domperidone, metoclopramide and ondansetron were also prescribed in some cases.

NSAIDs (14.84%) (Table 3) prescribed was less as observed by Bhansali et al. (16.24%) and Shankar et al. (19.7%) respectively. Among NSAIDs commonest prescribed was diclofenac (both monotherapy and combination) (91.16%), which matched the findings as observed by Bhansali et al. (89.72%).

Multivitamins and minerals (10%) prescribed were more as disclosed by Shankar et al. (2.6%) and commonest vitamin prescribed was vitamin B as FDCs (73.33%).

Serratiopeptidase (1.72%) prescribed was almost more or less near to the observation of Shankar et al. (1.5%).

Total FDCs prescribed (12.42%) was less as observed by Sharma et al. (25.78%) and Parveen et al. (18.84%) (Table 5).

Drugs prescribed from WHO EML (45.31%) was less while from National EML (69.25%) was more than as revealed by Sharma et al. (52.96% and 68.93% respectively). Injectable dosage forms (100%) were more as observed by Sharma et al. (86.08%).

**Drug consumption and cost analysis**

Average costs of AMA, GIT related agents, NSAIDs, vitamin B and IV fluids are Rs. 352/-, 90/-, 20/-, 8/- and 130/-INR respectively per day per prescription. Average cost of drug per encounter was Rs. 610/- INR ($10.34, USD) that is very less as disclosed by Sharma et al. (Rs. 1090.40 INR or $18.30 US Dollar) in the post-operative patients.

It has been observed that cephalosporins (third generation) and their combinations (with penicillinase inhibitors) are frequently prescribed which is the cause of concern in the present scenario. Secondly, AMA and other medicines are prescribed by non-generic (Trade) name, thereby, increasing the total cost of treatment in post-operative patients.

**Implications of the study**

The study reflects the common disorders for which surgeries are performed in a tertiary care teaching institute/hospital. This study revealed that the poly-pharmacy is a very common practice. The prescribing of medicines, according to the National Essential Medicine/Drug List is adequate but needs a lot of improvement. The prescription of medicine by non-generic (Trade) name is very common, which increases the cost of the drug therapy in a developing country like India.

**Limitations**

This study had a small sample size and was done in the patients admitted in the Department of Surgery. We did not enroll patients from Orthopedic, ENT, Eye/Ophthalmology, Obstetrics and Gynae Departments. Therefore, it gave us a limited pattern of drug use in post-operative patients in the
A prospective study, with large sample size in all the operative cases need to be done to evaluate the prescribing pattern and cost analysis in a better way.

CONCLUSION

Most of the patients with surgical diseases require surgical intervention; therefore, they require more than one medication post-operatively to prevent wound infections and to relieve pain. There is a high tendency and frequency to prescribe more than four drugs, but less are prescribed from the National EML. Most of the drugs prescribed are generally AMAs, GIT related and NSAIDs. There is an urgent need to develop proper prescription writing skills in budding doctors for the use of EML and generic medicines to reduce the cost of treatment and better compliance of the patients.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethical Committee

REFERENCES
