

# Drug information center as referral service in a South Indian tertiary care hospital

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## Abstract

**Objective:** The objective of this study is to assess the various aspects of drug information services (DIS) provided in the DI center of a tertiary care hospital.

**Materials and Methods:** DI queries received from various departments from April 2013 to May 2017 were included in the study. Various aspects such as year- and department-wise distribution, reason for sending the queries, mode of receipt and reply, time taken for reply, number of visit for bedside examination of patients, and number of references given per query were analyzed. All the results are expressed in numbers and percentages.

**Results:** Fifty-five DI queries were received during the study period. Most of the queries were received from Department of Orthopedics (26, 47.27%), followed by Neurology (4, 7.27%). Most common mode of receipt of queries (41, 74.55%) was by Cross-reference form not case record form followed by phone calls (8, 14.55%) and outpatient department (OPD) case sheet (6, 10.9%). CRF with attached opinion was the most common mode of reply (41, 74.55%) followed by phone calls (7, 12.73%), and OPD case sheets (6, 10.9%). The most common reason for sending queries was antimicrobials-related problem (25, 45.46%), followed by the use of anticoagulants (13, 23.63%). Most of the queries were replied within 24 h (31, 56.36%), followed by 48 h (14, 25.45%). Out of 41 CRF received for in-patients, bedside examination was requested in 23 (56.09%) CRF. There was an increasing trend in the number of queries received every year with more queries received during 2016 (23, 41.82%).

**Conclusions:** DIS if utilized properly can be used as a referral service such as other specialties in a tertiary care hospital.

**Keywords:** Adverse drug reaction, cross-reference form, drug information query, drug information service, mode of receipt

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## INTRODUCTION

Drug information (DI) is the provision of written and/or verbal information or advice about drugs and drug therapy

in response to a request from other health-care providers, organization, committees, patient, or members of public.<sup>[1]</sup>

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Drug information center (DIC) is an information center which provides drug information (DI) to health-care professionals.<sup>[2]</sup> DI service (DIS) is the service that encompasses the activities of specially trained individuals to provide accurate, unbiased, factual information, primarily in response to patient-oriented problems that occurred from the health-care teams.<sup>[3]</sup> The purpose of DIS is to provide accurate, authentic, unbiased, updated information to health-care professionals, and patients/consumers. DI can be related to the specific drug, dose, route of administration, adverse drug reactions (ADRs), toxic effect, therapeutic guideline, newly marketed drugs for a specific disease, approval status of the drug, or indication for particular disease conditions. Proper functioning of DIC improves the quality of evidence-based practice by providing updated and authentic information to the health-care professionals. It also promotes rational use of medicines, improves quality of patient care, and patient outcomes. DI queries are received by the DIC through various modes such as phone call or by prescribed written forms.

DI can be obtained from different sources such as primary, secondary, and tertiary. The primary source is the foundation on which secondary and tertiary information is based. It is available in original articles, case reports, case series, etc. Secondary source functions as a guide to or review of primary literature. This includes review articles, meta-analyses, indexes (Index Medicus), abstracts (International Pharmaceutical Abstracts), and combinations of abstracts and full-text reprints. The tertiary source includes formulary manuals, standard treatment manuals, textbooks, general reference books, drug bulletins, and drug compendia.<sup>[4]</sup> DI queries can be categorized into judgmental or nonjudgmental type based on the score as described by Reppe *et al.*<sup>[5]</sup> The information regarding scoring system is explained in Table 1.

Nowadays, the number of drugs coming to the market are increasing compared to the past. The treatment guidelines are also changing more frequently due to availability of new drugs in the market. Due to the increase in availability of DI, it is a very difficult task to remember such vast information on drugs.<sup>[6]</sup>

As stated by the World Health Organization, DIC is a core component of national programs to promote the rational use of drugs.<sup>[7]</sup> In most developing countries, there is lack of adequate DI due to following reasons: (1) limited availability of current literature (2) poor documentation and dissemination of the limited available information.<sup>[8]</sup> Compared to developing nations, information flow and practice of DIS is satisfactory in developed countries. In India, the effectiveness of existing DICs is questionable owing to various factors such as lack of funds, insufficient trained staff, nonavailability of research-based periodic drugs and therapeutic information, limited availability of current literature, limited or poor documentation and dissemination of whatever little information is available, and poor or no information exchange services. This improper functioning results in provision of biased and limited information, which can contribute to the poor patient outcome in terms of pharmacoeconomics. Therefore, maintenance of quality of service provided by DICs is an essential part of DIS.<sup>[9]</sup>

DIS in India is now in its infancy stage. There are a few centers throughout India dealing with DISs. This is due to lack of infrastructure, workforce, and lack of interest in this area. Most of the centers are working in collaboration with hospitals while a few are functioning at secondary care hospitals (district level) and some at tertiary care hospitals. In most DICs in India, DI is provided by trained clinical pharmacists. With this background, the objective of this study was to appraise of the use DIC by health-care professionals in a tertiary care hospital from the provider's perspective.

**MATERIALS AND METHODS**

A retrospective study was conducted to collect and analyze the information obtained from DIS register of DIC functioning in the Department of Clinical Pharmacology, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, from April 2013 to May 2017. The information regarding the queries asked by the various clinical departments either by cross-reference form, phone call, or during ward round is recorded in the register along with the mode of receipt and reply. The DIC in our setup remains open during usual departmental

**Table 1: Scoring for considering judgmental or nonjudgmental type of queries (Reppe *et al.*<sup>[5]</sup>)**

Characteristics	Score 1	Score 2	Score 3
Number of drug	One	Two (from different class)	Three (from different class)
Literature search category	Not needed: Can be answered without searching the literature and without consulting colleagues	Simple: Necessary to search databases containing monographs such as the Micromedex, the SmPC for the drug, reference books, and/or colleagues/other health professionals	Advanced: If search in databases such as Medline, Embase, or Cochrane to obtain original articles is necessary

Score 1: Nonjudgmental, Score 3: Judgmental, Score 2: Equivocal, SmPC: Summary of product characteristics

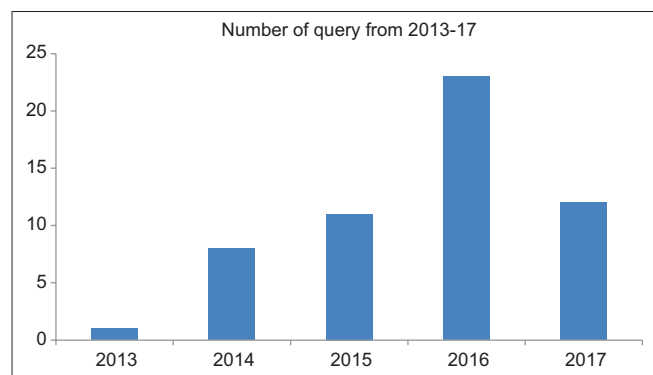
working hours on all working days. The faculties and residents in the Department of Clinical Pharmacology working after the completion of MD Pharmacology course give their opinion after thorough literature search about the individual queries. For this study, the information for all the queries were compiled and analyzed for various aspects such as year-wise distribution, department-wise distribution, reason for sending queries, mode of receipt and reply, type and number of references given along with the reply, time of reply, number of patient visits for bedside examination, and drug class for which queries were received. All the results are expressed in numbers and percentages.

**RESULTS**

A total of 55 queries were received from April 2013 to May 2017. Most of the queries were received in 2016 (23, 41.82%), followed by 2017 (up to May) (12, 21.82%) and 2015 (11, 20%) as shown in Figure 1. There was an increasing trend in the number of queries received since 2013 except 2017 as information were included up to the month of May. Most of the queries were received from department of Orthopedics (26, 47.27%) followed by Neurology (4, 7.27%). Fifteen queries were received from five departments (Clinical immunology, Surgery, Psychiatry, Obstetrics and Gynecology, and Cardio Thoracic Vascular Surgery, three from each department as shown in Table 2.

Highest numbers of queries were received for issues related to antimicrobial use (25, 45.46%) followed by ADRs (13, 23.63%), and use of anticoagulants (9, 16.63%) as shown in Table 3.

Most common mode of receipt of queries was by cross-reference form (CRF) (41, 74.55%) followed by phone calls (8, 14.55%) and outpatient department (OPD) case sheets (6, 10.9%) as shown in Table 4.



**Figure 1:** Year-wise distribution of queries

Reply by CRF (41, 74.55%) was the most common mode followed by phone call (7, 12.73%), OPD case sheets (6, 10.9%), and departmental presentation (1, 1.82%) as shown in Table 4.

Out of the 41 queries received through CRF, in 23 (56.09%) CRF, bedside examination was required [Table 4]. Moreover, for all CRF-related queries, bedside examination was done by one of the Clinical Pharmacologists.

Most of the queries were replied within 24 h (31, 56.36%), followed by 48 h (14, 25.45%) and 72 h (2, 3.64%). For eight queries, data about time of reply were not documented in the register [Table 4].

Only for 30 queries, references given as evidence for the queries were documented in the register while for the remaining 25 queries references were not found. A total of 72 references were provided for 30 queries with an average of 2.48 references per query [Table 4].

Out of the 72 references, 70 were web based, and only two were from textbooks [Table 4].

Table 5 shows 10 most important types of queries received by DIC during the study which included drug reaction with eosinophilia and systemic symptoms syndrome, multiple antibiotic sensitivity syndrome, warfarin-related nephropathy, warfarin resistance, purple glove syndrome, etc.

**DISCUSSION**

A retrospective study was conducted for the use of DIC as referral service by health-care professionals in a tertiary care hospital in South India. All the data were collected from

**Table 2: Department wise distribution of queries**

Department	n (%)
Orthopedics	26 (47.27)
Neurology	4 (7.28)
CTVS	3 (5.45)
Immunology	3 (5.45)
Psychiatry	3 (5.45)
Surgery	3 (5.45)
O and G	3 (5.45)
Dermatology	2 (3.64)
Radiotherapy	2 (3.64)
Cardiology	1 (1.82)
Medical oncology	1 (1.82)
Medicine	1 (1.82)
Nephrology	1 (1.82)
Pediatrics	1 (1.82)
Emergency medicine	1 (1.82)
Total	55 (100)

CTVS: Cardiothoracic and vascular surgery, O and G: Obstetrics and Gynecology

the DIS register from April 2013 to May 2017. The total number of queries received during the study was 55. This number is less compared to 192 queries received from the study done by Rajanandh *et al.* in an 8-month retrospective study.<sup>[10]</sup> The reason for getting less number of queries in our center could be due to (a) newly established DIC (b) lack of awareness among health-care professionals about DIC and DIS (c) lack of proper documentation of all the queries during earlier stage, (d) updated knowledge of doctors about specific drugs that they are dealing with, (e) not sending queries for simple things such as dose, route of administration, indication for use in specific conditions. Of all the queries received, in the study conducted by Rajanandh *et al.*<sup>[10]</sup> 57.8% were through verbal mode, and 25.52% of the queries were for dosage and indication. In that study, 49.4% queries were replied immediately. However, in our study, none of the queries enquired about dosage and indication. Similarly, our center took more time for providing the reply, and none of the queries were replied immediately. This shows that the clinicians of our institute use DIC as referral service only for the queries they were unable to find answer by themselves.

The analysis showed that the number of queries received by the DIC is increasing since 2013 with maximum during 2016. For the year 2017, data available till the month of May were included, and it was the second highest in the comparison. The reason for increase in the number of queries may be attributed to rising awareness among health-care professionals, complex scenario arising while treating patients, acceptable reply with suitable evidence from the DIC to the previous queries sent, and proper documentation of queries in the recent years compared to previous years.

Maximum numbers of queries were received for antimicrobials followed by anticoagulants. The queries received for antimicrobials were about the treatment of multidrug resistance organisms, resistance to meropenem (e.g., *Acinetobacter boumani* infection), and choice of antibiotics in case of renal and liver failure in a specific disease condition and patients. Among the queries related to anticoagulants, most of them were related to either warfarin resistance, opinion regarding shifting the drug to acenocoumarol or use of newer anticoagulants.

Most common mode of receiving queries in our study was by cross-reference form (CRF) followed by phone calls in contrary to queries during ward rounds in the study conducted by Mudigubba *et al.*<sup>[11]</sup> This dissimilarity could be due to the following reasons (a) DIC is situated in the Clinical Pharmacology department and all the queries

**Table 3: Reason for sending queries**

Reason/issues related	n (%)
Antimicrobial use	25 (45.46)
Adverse drug reactions	13 (23.63)
Anticoagulant use	9 (16.36)
Drug interactions	3 (5.45)
Drug desensitization	1 (1.82)
Pharmacogenomic issues	1 (1.82)
Poisoning	1 (1.82)
Regulatory issues	1 (1.82)
Therapeutic drug monitoring	1 (1.82)
Total	55 (100)

**Table 4: Various aspects of drug information queries**

	Number of query (%)
Mode of receipt	
CRF	41 (74.55)
Phone calls	8 (14.55)
OPD case sheets	6 (10.9)
Total	55 (100)
Mode of reply	
CRF	41 (74.55)
Phone calls	7 (12.73)
OPD case sheets	6 (10.9)
Departmental presentation	1 (1.82)
Total	55 (100)
Time of reply	
Within 24 h	31 (56.36)
Within 48 h	14 (25.45)
Within 72 h	2 (3.64)
Not documented	8 (14.55)
Total	55 (100)
Visit for bedside examination of IPD patient	
Mentioned in CRF	23 (56.09)
Not mentioned but visited	18 (43.91)
Total	41 (100)
References given	
Web based	70 (97.23)
Text-book	2 (2.77)
Not documented	25 (00)
Total	72 (100)

CRF: Cross reference form, OPD: Outpatient department, IPD: Inpatient department

**Table 5: 10 most important types of drug information queries**

Queries (n)
1. Warfarin resistance/unresponsiveness (7)
2. Multidrug resistant <i>Acinetobacter baumannii</i> infection (3)
3. DRESS syndrome (3)
4. Multiple antibiotic sensitivity syndrome (2)
5. Warfarin-related nephropathy (1)
6. Purple glove syndrome (1)
7. Genetic polymorphism in metabolism of olanzapine and chlorpromazine (1)
8. Paracetamol induced anaphylaxis (1)
9. Discrepancy between LCMS and RIA values for cyclosporine level (1)
10. Diclofenac-induced hepatotoxicity (1)

LCMS: Liquid chromatography-mass spectrometry, RIA: Radioimmunoassay, DRESS: Drug reaction with eosinophilia and systemic symptoms

regarding DI are handled by clinical pharmacologist in our institution rather than clinical pharmacists who attend ward rounds in few setups as described in other studies (b) separate clinical pharmacology ward and OPD for

receiving DI queries; and inability to attend ward rounds by the Clinical Pharmacologists owing to lack of manpower.

The common mode of reply sent by DIC for queries was through CRF along with enclosure of written opinion and reliably attached printed reference for immediate workup by the physicians. This is similar to the mode of reply given in other studies. In a study conducted by Peter *et al.*,<sup>[12]</sup> printed material was the most common mode of reply sent from DIC. In our center, most of the queries were replied within 24 h as a matter of policy decision (but not immediately). However, the exact time of reply was not recorded in the register. This is in contrast to the study conducted by Venkatraghavan *et al.*<sup>[13]</sup> in which 82.4% of the queries were replied immediately, 6.3% within 2–4 h, and 11.1% within 1 or 2 days. This dissimilarity in finding could be due to the complex nature of queries received by our DIC, which required more time for searching articles from different sources to provide reply with authentic evidence.

In our study, most of the queries were received from Department of Orthopedics, followed by Neurology. This is in contrast to the study by Puttegowda *et al.*<sup>[14]</sup> that mentioned most of the queries were received from Department of General Medicine, followed by Pediatrics. Almost 58.18% of queries were obtained from surgical departments in our study which could be due to comparative lack of knowledge about currently available information on drugs and lack of time.

Most of the references given by DIC were from internet sources, and only very few were taken from textbooks. The reason may be due to the lack of availability of current evidence in textbooks for complex query requiring multiple sources of evidence. It is also a unique feature of our DIC compared to other studies. This is different from the finding of a study conducted by Venkatraghavan *et al.*,<sup>[13]</sup> who utilized Micromedex (67%), textbooks (25.1%), and website (18%) as sources of information.

The average number of references given with attached opinions was 2.4 per query for the admitted patients. The information regarding references for 25 queries was not available (mostly for phone call query and OPD-based query) which may be due to the nondocumentation of queries received by phone call and OPD case sheets.

Based on the number of drugs per query, type of literature source (primary and secondary or tertiary information), time of reply (in our study: late), request for bedside visit, it can be presumed that all the queries received by CRF

were judgmental type though data for most queries received other than CRF were not available in the register.

In most of other studies, opinion was given by clinical pharmacists who are trained to run DIC, but in our center, it is run by Clinical Pharmacologist who has completed their MBBS, MD in Pharmacology and either pursuing DM super specialty course in Clinical Pharmacology as Senior Resident or completed the course and working as faculty in the department of clinical pharmacology. In every case handled by Senior Resident, opinion is given after discussing with the faculty member(s) in the department to make sure that the evidence given is authentic, updated, and conferring to that specific condition and the patient.

## CONCLUSIONS

Proper use of DIS needs clinicians' awareness about DIC as well as the service. DIS can be used as a referral service like other specialties in a tertiary care hospital, if it is utilized properly by the clinicians. Clinical Pharmacologist can contribute effectively to improve the safety and quality of patient care through DIS. The number of queries in DIC can be increased by creating awareness among physicians through continuing medical educations (CMEs), providing easy accessibility to DIC through intra or internet service, and running 24 hours service for DI.

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## Conflicts of interest

There are no conflicts of interest.

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