

## Review

# A cumulative review on the utilisation of drug information services provided in India

G. K. Sadagoban, Aiswarya Baiju, Samantha Sanjeev, M. Ayilya and Swathi Swaroopa Borra\* 

Department of Pharmacy Practice, JSS College of Pharmacy, JSS Academy of Higher Education & Research, Ooty, Nilgiris, Tamil Nadu, India

\*Correspondence: Swathi Swaroopa Borra, Department of Pharmacy Practice, JSS College of Pharmacy, JSS Academy of Higher Education and Research, Ooty, Tamil Nadu 643001, India. Email: [swathimasthani@hotmail.com](mailto:swathimasthani@hotmail.com)

Received April 30, 2021; Accepted May 24, 2021.

## Abstract

### Objective

To understand the utilisation of drug information services provided in India.

### Key findings

The quantitative aspects of drug information queries were assessed. Majority of the queries were raised from the General Medicine Department (43.64%) and by clinicians (41.77%), most of them were regarding adverse drug reactions (18.17%) and the prime purpose of the enquirer was to update knowledge (46.73%). The three steps for qualitative assessment and evaluation of drug information services were assessed and the overall response from the receiver's perspective was found to be very good/satisfactory and the provider's perspective was rendered excellent.

### Summary

There is an increased need to expand the scope of drug information services and promote awareness regarding the services and it is recommended that every hospital have a Drug Information Centre.

**Keywords:** drug information India; Medicine Information Center; utilization of DIC; assessment and evaluation

## Introduction

The Pan American Health Organisation (PAHO) defines Drug Information Centres (DICs) as operational units that provide technical and scientific information about drugs in an objective and timely manner.<sup>[1]</sup> The aim of the drug information service (DIS) is to provide accurate, unbiased information primarily in response to patient-oriented drug and poison related queries received from various members of the healthcare team.<sup>[2]</sup> Providing drug information to patients and other healthcare professionals to ensure the safe and effective use of medications is the fundamental responsibility of pharmacists.<sup>[3]</sup>

In the early 1900s, the increase in the discovery of new drugs and literature on the existing as well as new drugs made it difficult

for healthcare professionals to retrieve relevant information. This led to the establishment of the first DIC by the University of Kentucky in 1962. In later years, there was a rise in the number of pharmacists-operated DICs; however, many of these centres had to close down in the mid-1980s due to the lack of budget. This led to the broadening of the scope of DISs involving the inclusion of educating allied health professions, providing evidence-based medical information, drug consultation, supporting the institutions' medication safety programmes and providing information systems support.<sup>[4]</sup>

In India, the national policies were more industry-focused than health-focused, hence the role of DIC needed to be enlightened and awareness had to be spread about the DIS and rational use of drugs. Recognising the importance of providing accurate

and unbiased information to healthcare professionals and consumers, the World Health Organization India Country Office collaborated with the Karnataka State Pharmacy Council (KSPC) and initiated the first independent DIC at the state level, in 1997.<sup>[5]</sup> DISs was initiated by JSS College of Pharmacy, Ooty, at the institutional level and Trivandrum Medical College at the hospital level.<sup>[4]</sup> The DIC of the KSPC in coordination with the Delhi Society for Promotion of Rational Drug Use (DSPRUD) had developed a standard treatment guideline and an essential drug list for Karnataka. The National Human Rights Commission (NHRC) recommends the establishment of DICs in all hospitals.<sup>[6]</sup>

The objective of the DIC is to identify the minimum criteria for establishing DICs at various levels to guide in recognising the value of monitoring and assessment in ensuring the quality of drug information dissemination, to serve as a guide for other centres, to provide a structured database of specialised information on medicines and therapeutics to meet the drug information need of various healthcare practitioners and to promote patient care through the rational use of drugs.<sup>[7]</sup>

DIC services are available as both reactive and proactive approaches. The reactive approach is widely used in hospital-based DIC, which provides answers to time-critical questions about the safe and efficient use of therapeutic and diagnostic pharmaceuticals to healthcare professionals. In proactive approach, some DICs publish and distribute frequent reports on a wide range of topics that includes drug-drug and drug-disease interactions, interpretation of therapeutic drug monitoring, adverse drug events, comparison of drug efficacy, safety profile, interpretation of therapeutic drug monitoring (TDM) levels, dosing recommendation for organ impairment, treatment guideline updates, approval and availability of new drugs, usage of drugs in any special circumstances, guidance on obtaining previously licensed drugs in other countries, salient study finding in reputed journals and plethora of questions from available literature sources.<sup>[8]</sup>

To ensure that the services are provided in a professional manner, qualitative assessment and evaluation of DIS are done. This includes three steps:<sup>[9]</sup>

The first step is the evaluation of drug information request and documentation forms for various parameters such as the speciality of practice, professional status of the enquirer, purpose of enquiry, category of question, mode of receipt of query, time frame to reply and references used.

The second step involves the quality of services provided from the receiver's perspective and is assessed through a feedback questionnaire.

The third step includes the assessment of the quality of DIS from the provider's perspective by using the Deutsche Stiftung für Internationale Entwicklung (DSE) - German Foundation for International Development/WHO seminar guidelines. Based on these guidelines, the queries are categorised as judgemental and non-judgemental types. The parameters assessed are securing enquirers' demographic data, obtaining background information, formulation and implementation of a search strategy, evaluation of literature and the response provided. After the evaluation of the queries, each query was given a rating from 1 to 5, where 5 indicated that the information provided was excellent and 1 indicated that consultation was unacceptable for use.

There exists a different Quality Assessment Checklist which consists of eight close-ended questions, where 'Yes' is given a score of

1 and 'No' is scored 0. The total score is then graded from grade A–D, where 7–8 points is Grade A and indicates the quality of service provided was excellent from the provider's perspective and points below 4 is Grade D and indicates that the service requires improvement.<sup>[10]</sup>

The benefits of DIC include promoting safe and effective use of medications by detecting and minimizing drug-related issues with prescriptions, promoting good clinical care practices and providing medication use policies, increasing pharmacist productivity to reduce time consumption by healthcare professionals in reviewing drug information, promoting patient compliance and medication adherence and aiding in reducing widespread practice of self-medication and medication abuse.<sup>[11]</sup>

The International Register of Drug Information Services (IRDIS), which is maintained by the Society of Hospital Pharmacists of Australia (SHPA) is the registering authority of DICs. As of 2016, 22 DICs in India have been registered with the IRDIS. Few of the registered DICs are:<sup>[12]</sup>

- Al Shifa Hospital, Perintalmanna, Kerala
- Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Pondicherry
- Bulletin on Drug and Health Information (BODHI), Calcutta, West Bengal
- Kovai Medical Centre and Hospital (KMCH), Coimbatore, Tamil Nadu
- JSS Medical College Hospital, Mysuru, Karnataka

So far, in India, studies on the services provided by the DIC have been conducted only at the institutional level. Hence, in this review, we aim at providing a cumulative review of the services provided by various DICs in the country.

## Method

A literature search in PubMed and ResearchGate was performed and articles published within the time frame of January 2002 to January 2021 were selected. A Boolean search of databases was implemented to combine a range of keywords: 'Evaluation' AND 'Assessment' OR 'Appraisal' AND 'Drug Information Services' OR 'Drug Information Center' AND 'India'. Studies were also obtained from journals by manual electronic search (Figure 1). The objective of this review is to understand the utilisation of DISs provided in India.

## Inclusion criteria

The quantitative aspects of DIC can be evaluated with professional status of the enquirer, medical speciality of enquirer, purpose of enquiry, type of drug query, mode of receipt of query, mode of reply and time frame to reply. From the aforementioned topics, we have selected four topics as the remaining topics are available only in few individualised articles.

## Exclusion criteria

All articles which did not detail the type of query, purpose of enquiry and the quantity of queries raised by various healthcare professionals and their specialised departments were excluded.

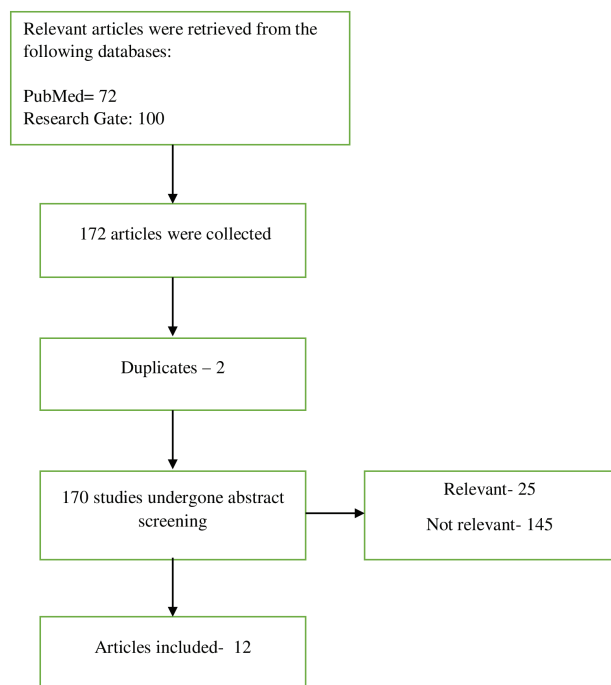


Figure 1. Literature search flowchart.

## Results

A total of 4459 queries were included from 12 articles regarding DICs in India (Table 1).

### Quantitative assessment of drug information queries

The quantitative dimension of the drug information queries was assessed as a mean percentage.

#### Queries received from different medical specialties (Table 2)

From 23 different medical specialties, the Department of General Medicine (43.64%) generated the most queries in the papers included in our review, followed by Paediatrics (8.09%), Dermatology (4.87%), Gynaecology (4.56%) and Cardiology (4.28%).

#### Categorisation of queries received (Table 3)

From 19 categories, most queries were raised regarding Adverse drug reactions (ADRs) (18.17%), Dosage and administration (17.12%), Drug interaction (11%), Drug indication (10.81%) and Drug therapy (10.16%).

#### Queries received from various healthcare professionals (Table 4)

Clinicians (41.77%), Interns (15.07%), Nurses (9.08%) and Postgraduates and Pharmacists (8.18%) individually were the healthcare professionals who contributed the greatest number of queries.

#### Purpose for approaching Drug Information Centre (Table 5)

The purpose of the healthcare professionals' enquiry was to Update knowledge (46.73%), Better patient care (35.01%) and Education/Academic (13.13%).

Table 1 Number of queries from articles regarding drug information services

Articles regarding drug information services	Number of queries
George B <i>et al.</i> <sup>[9]</sup>	666
Rajanandh MG <i>et al.</i> <sup>[13]</sup>	469
Vishwanth J <i>et al.</i> <sup>[14]</sup>	113
Kumar SV <i>et al.</i> <sup>[15]</sup>	344
Rajanandh MG <i>et al.</i> <sup>[16]</sup>	192
Patel H <i>et al.</i> <sup>[10]</sup>	1204
Kumar MM <i>et al.</i> <sup>[17]</sup>	122
Krishnaveni K <i>et al.</i> <sup>[18]</sup>	283
Praveen KM <i>et al.</i> <sup>[19]</sup>	277
Malik KM <i>et al.</i> <sup>[20]</sup>	205
Jeevangi VM <i>et al.</i> <sup>[21]</sup>	122
Pradeep P <i>et al.</i> <sup>[22]</sup>	512
Total number of queries =	4459

### Qualitative evaluation of drug information queries

In 7 of the 12 articles, drug information request forms and documentation forms were evaluated on parameters that included the professional status of the enquirer, speciality of practice, purpose of enquiry, categorisation of question, mode of receipt of query, time frame to reply, categorisation of question and references used.<sup>[9]</sup>

Receiver's perspective (Table 6) was assessed in 10 articles based on a feedback questionnaire that included the following components: awareness of DIS, utilisation of the services, receiving the response in an appropriate and timely manner, awareness and utilisation of the online drug information system, usefulness of the service in providing patient care and rating of the services provided.<sup>[9]</sup> In these articles, the feedback on the service provided was found to be very good/satisfactory.

The quality of the service provided was assessed in three articles from the provider's perspective (Table 6) using a form developed in accordance with the DSE/WHO seminar guidelines and two articles used the quality assessment checklist. The cumulative response for the quality of the services provided was rendered excellent.

## Discussion

Among the various healthcare specialties and healthcare professionals assessed, a great percentage of queries were received from the General Medicine Department and Clinicians, respectively. Due to increasing co-morbidities and polypharmacy condition, a general medicine practitioner's skill in delivering non-surgical healthcare to the general population, as well as their holistic approach to diagnosis and patient care, becomes more complex. As they deal with patients with comorbid conditions and a wide range of medications are utilised, there is an increased number of drug information queries raised by them.

Among the 4459 queries received, the greatest number of queries were regarding ADRs, followed by dosage and administration of drugs. Information on ADRs is often used to improve patient care by recognising and clarifying the suspected ADRs. Hence, DICs have the potential to play a significant role by aiding physicians with required drug information for effective communication between the patients and healthcare professionals by encouraging the reporting of ADRs for safer drug use.<sup>[23]</sup>

The majority of queries to the DIC were for the purpose of updating knowledge, followed by better patient care and education/

**Table 2** Drug information queries received from different medical specialities

Speciality	Articles regarding Drug Information Centres in India (% of queries)												Mean %
	George B <i>et al.</i> <sup>[9]</sup>	Rajanandh MG <i>et al.</i> <sup>[13]</sup>	Vishwanth MG <i>et al.</i> <sup>[14]</sup>	Vishwanth J <i>et al.</i> <sup>[15]</sup>	Kumar SV <i>et al.</i> <sup>[16]</sup>	Rajanandh MG <i>et al.</i> <sup>[17]</sup>	Patel H <i>et al.</i> <sup>[18]</sup>	Kumar MM <i>et al.</i> <sup>[19]</sup>	Krishnaveni K <i>et al.</i> <sup>[20]</sup>	Praveen KM <i>et al.</i> <sup>[21]</sup>	Malik KM <i>et al.</i> <sup>[22]</sup>	Jeevangi VM <i>et al.</i> <sup>[23]</sup>	
General Medicine	–	13	21.23	42.4	52.6	26	77.85	62.89	34.8	89.76	67.21	35.93	43.64
Surgery	2.55	–	2.65	–	–	19.35	–	2.82	–	1.95	1.64	–	2.58
Infectious diseases	–	–	–	–	–	–	–	4.59	–	–	–	–	0.38
Cardiology	6	11.51	–	9	4.6	–	–	–	20.26	–	–	–	4.28
Gastroenterology	–	–	–	–	–	–	–	–	9.69	–	–	–	0.81
Chest and Tuberculosis	–	8.1	4.42	–	6.2	–	–	–	5.72	–	–	–	2.04
ENT	–	8.1	–	–	–	–	–	–	1.32	–	–	–	0.78
Psychiatry	2.55	8.1	–	–	–	–	–	–	–	–	–	6.05	1.39
Endocrinology	–	7.03	–	–	–	–	–	–	–	–	–	–	0.59
Gynaecology	6.75	6.82	–	–	9.3	–	–	9.18	1.76	–	9.01	11.91	4.56
Paediatrics	11.8	6.6	12.37	12	4.1	15.61	9.84	6.36	–	–	8.2	10.16	8.09
Oncology	–	5.97	–	3.1	–	–	–	–	–	3.41	–	8.01	1.71
Nephrology	21.17	5.75	–	–	3.1	–	–	–	3.96	–	–	–	2.83
Neurology	11.81	5.33	–	–	–	–	–	–	6.6	–	–	5.66	2.45
Dermatology	7.66	4.69	14.14	2.9	2.08	8.47	12.3	–	–	–	–	6.25	4.87
Orthopaedics	–	–	3.53	–	–	–	–	5.3	15.85	–	6.56	–	2.6
Urology	1.65	–	–	–	–	–	–	–	–	–	–	–	0.14
Dentistry	6	–	–	–	–	–	–	–	–	–	–	–	0.5
Ophthalmology	–	–	–	–	0.5	–	–	–	–	–	–	–	0.04
Causality	–	–	–	–	–	–	–	–	–	–	–	5.66	0.47
Nursing	3.45	–	–	–	–	–	–	–	–	–	–	–	0.29
Pharmacy	–	4.05	–	–	10.9	–	–	–	–	0.49	–	–	1.29
Nutrition	–	2.55	–	–	–	–	–	–	–	–	–	–	0.21
Others	18.62	2.34	41.58	30.2	6.2	–	–	8.83	–	4.39	7.38	10.35	10.82

“–”, not available; ENT, Ear, Nose and Throat.

**Table 3** Categorisation of drug information queries received

Type of Enquiry	Articles regarding Drug Information Centres in India (% of queries)												Mean %
	George B <i>et al.</i> <sup>[9]</sup>	Rajanandh MG <i>et al.</i> <sup>[13]</sup>	Vishwanth J <i>et al.</i> <sup>[14]</sup>	Kumar SV <i>et al.</i> <sup>[15]</sup>	Rajanandh MG <i>et al.</i> <sup>[16]</sup>	Patel H <i>et al.</i> <sup>[10]</sup>	Kumar MM <i>et al.</i> <sup>[17]</sup>	Krishnaveni K <i>et al.</i> <sup>[18]</sup>	Praveen KM <i>et al.</i> <sup>[19]</sup>	Malik KM <i>et al.</i> <sup>[20]</sup>	Jeevangi VM <i>et al.</i> <sup>[21]</sup>	Pradeep P <i>et al.</i> <sup>[22]</sup>	
Dosage and administration	27	12.36	20	6	13.02	21.59	18.8	8.8	8.81	12.68	36.03	20.31	17.12
ADR	24.7	18.55	16.12	21	30.7	7.97	16.39	21.2	12.77	9.76	17.65	21.28	18.17
Drug therapy	15.3	—	—	34	8.8	4.90	—	6.3	11.45	29.27	—	11.91	10.16
Drug interaction	8.2	4.9	8.38	16	4.6	6.48	9.02	40	8.37	1.95	13.98	10.16	11
Indication	—	27.29	11.61	8	12.5	7.89	21.31	2.5	24.22	0.98	7.35	6.05	10.81
Mechanism of action	—	12.79	—	—	—	—	—	—	3.08	—	—	—	1.32
Drug overview	—	13.43	—	—	—	—	—	—	—	—	—	—	1.12
Contraindications and precautions	—	10.66	—	—	—	—	10.66	—	6.16	—	—	—	2.29
Availability and cost	—	—	—	—	—	8.7	—	3.9	2.64	—	1.47	5.66	2.7
Pharmacokinetics and pharmacodynamics	—	—	7.74	—	—	5.98	9.84	19.1	2.64	0.49	2.94	2.92	4.3
Toxicology	—	—	4.51	—	—	—	—	6.4	—	—	0.73	6.25	1.49
Pregnancy and lactation	—	—	—	—	—	7.56	5.74	—	—	—	—	6.25	1.63
Teratogenicity	—	—	—	—	—	—	—	35	—	—	—	5.66	3.39
Identification	—	—	—	—	—	—	—	—	0.44	—	—	—	0.04
Stability	—	—	—	—	—	—	—	—	—	—	—	1.14	0.09
Compound formulation	—	—	—	—	—	2.74	—	—	—	—	—	2.34	0.42
Dosage adjustment	—	—	—	—	—	15.7	—	—	—	—	—	—	1.31
Drug efficacy	—	—	—	—	—	3.97	—	—	—	—	—	—	0.33
Others	21.1	—	31.61	15	30.2	—	8.2	5.3	19.37	38.54	19.85	—	15.76

“—”, not available.

**Table 4** Drug information queries received from various healthcare professionals

Status of the enquirer	Articles regarding Drug Information Centres in India (% of queries)											Mean %	
	George B <i>et al.</i> <sup>[9]</sup>	Rajanandh MG <i>et al.</i> <sup>[13]</sup>	Vishwanth J <i>et al.</i> <sup>[14]</sup>	Kumar SV <i>et al.</i> <sup>[15]</sup>	Rajanandh MG <i>et al.</i> <sup>[16]</sup>	Patel H <i>et al.</i> <sup>[10]</sup>	Kumar MM <i>et al.</i> <sup>[17]</sup>	Krishnaveni K <i>et al.</i> <sup>[18]</sup>	Praveen KM <i>et al.</i> <sup>[19]</sup>	Malik KM <i>et al.</i> <sup>[20]</sup>	Jeevangi VM <i>et al.</i> <sup>[21]</sup>		Pradeep P <i>et al.</i> <sup>[22]</sup>
Clinicians	17.7	13.43	21.23	25	21.3	39.97	71.31	73.14	47.13	37.07	92.62	41.4	41.77
Postgraduates	15.7	–	–	18	–	48.17	–	–	0.44	9.76	–	6.05	8.18
Nurses	–	19.61	–	16	–	–	4.92	11.66	23.34	16.1	–	17.38	9.08
Interns	–	44.77	39.82	12	44.7	8.06	20.49	–	7.48	–	–	3.51	15.07
Pharmacists	–	12.15	–	13	13.5	–	3.82	9.18	4.4	35.12	–	7.03	8.18
Nutritionists	–	5.9	–	–	–	–	–	–	–	–	–	–	0.49
Others	2.1	4	–	15	20.3	–	–	6.07	17.17	1.95	7.38	23.63	8.13

“–”, not available.

**Table 5** Purpose for approaching Drug Information Centre

Purpose of enquiry	Articles regarding Drug Information Centres in India (% of queries)											Mean %	
	George B <i>et al.</i> <sup>[9]</sup>	Rajanandh MG <i>et al.</i> <sup>[13]</sup>	Vishwanth J <i>et al.</i> <sup>[14]</sup>	Kumar SV <i>et al.</i> <sup>[15]</sup>	Rajanandh MG <i>et al.</i> <sup>[16]</sup>	Patel H <i>et al.</i> <sup>[10]</sup>	Kumar MM <i>et al.</i> <sup>[17]</sup>	Krishnaveni K <i>et al.</i> <sup>[18]</sup>	Praveen KM <i>et al.</i> <sup>[19]</sup>	Malik KM <i>et al.</i> <sup>[20]</sup>	Jeevangi VM <i>et al.</i> <sup>[21]</sup>		Pradeep P <i>et al.</i> <sup>[22]</sup>
Update knowledge	45.3	43.71	31.61	44	43.03	39	69.67	38.86	52.86	53.66	56.56	42.57	46.73
Better patient care	52.8	36.24	26.47	24	44.9	61	30.33	31.81	21.58	35.61	31.15	24.21	35.01
Education/Academic	1.66	20.04	37.5	33	12.02	–	–	28.26	–	–	10.65	14.06	13.1
All of the above	–	–	4.41	–	–	–	–	–	–	–	1.64	9.14	2.1
Others	–	–	–	–	–	–	–	1.06	25.55	10.73	–	–	3.11

“–”, not available.

**Table 6** Qualitative assessment from receiver's and provider's perspective

Articles	Receiver's perspective	Provider's perspective
George B <i>et al.</i> <sup>[9]</sup>	65% – Good 25.5% – Satisfactory 12.5% – Needs improvement	Judgemental queries 50% – Excellent 40% – Very good 10% – Good Non-judgemental queries 50% – Excellent 50% – Very good 80.6% – Excellent 19.4% – Good
Rajanandh MG <i>et al.</i> <sup>[13]</sup>	75.4% – Excellent 24.6% – Well	–
Vishwanth J <i>et al.</i> <sup>[14]</sup>	The response was rated good and satisfactory	–
Kumar SV <i>et al.</i> <sup>[15]</sup>	–	–
Rajanandh MG <i>et al.</i> <sup>[16]</sup>	10.4% – Excellent 77.4% – Very good 10.9% – Good 1.04% – Satisfactory	–
Patel H <i>et al.</i> <sup>[10]</sup>	–	64.5% – Excellent 30.8% – Good 3.37% – Needs Improvement
Kumar MM <i>et al.</i> <sup>[17]</sup>	–	Judgemental queries 45% – Excellent 35% – Very good 20% – Good Non-judgemental queries 40% – Excellent 35% – Very good 25% – Good
Krishnaveni K <i>et al.</i> <sup>[18]</sup>	63.6% – Good 30.03% – Satisfactory 6.3% – Needs improvement	–
Praveen KM <i>et al.</i> <sup>[19]</sup>	–	–
Malik KM <i>et al.</i> <sup>[20]</sup>	The response was rated satisfactory	From 31 randomly selected queries 51.61% – Excellent 35.48% – Good 12.9% – Needs improvement
Jeevangi VM <i>et al.</i> <sup>[21]</sup>	24.59% – Excellent 54.91% – Very good 13.11% – Good 7.37% – Satisfactory	–
Pradeep P <i>et al.</i> <sup>[22]</sup>	–	84.17% – Excellent 15.23% – Very good 0.58% – Good

“–”, not available.

academic purposes. Accreditation Council for Graduate Medical Education (ACGME) describes medical knowledge as one of its six clinical core competencies for physicians, it is essential for the physicians to update knowledge on the evolving biomedical, clinical, epidemiological and social behavioural sciences and apply this knowledge to improve patient-specific outcomes.<sup>[24]</sup>

Comparisons of various studies revealed that qualitative assessment was not performed in all the studies. As a result, it should be ensured that a quality audit is conducted to assess the functioning of the services.

### Limitations

The limited data on qualitative assessment of DISs is because majority of the papers did not conduct the assessment as there is no standard checklist or recommendations till date. Lack of reference articles that assess the cumulative utilisation of various DISs in India has made it difficult to produce a comparative result of the review.

### Future prospects of DIS in India<sup>[25]</sup>

DIC can help reduce physician workload by keeping track of medical records of patients with comorbid or chronic conditions by contacting and conducting follow-up on possible patients to enhance their health outcomes.<sup>[25]</sup> Provision of information about complementary and alternative medicines such as Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy (AYUSH) could expand the scope of DICs in developing countries, where a large number of patients extensively use these medicines. DICs within academic centres in India can provide such information by collaborating with the existing in-house departments of complementary and alternative medicines.<sup>[8]</sup> TDM services, ADR detection, cooperation with forensic scientists for illicit product identification, forensic pharmacology, post-mortem toxicology and expert testimony have all been attempted successfully in Denmark and can be implemented in India as well. Other initiatives like online and offline outreach education, where pharmacists/pharmacologists are trained



with details of medical knowledge to interact with physicians and to share the best prescription practices as a way of encouraging evidence-based medicine methods and rational drug use, can be practiced.<sup>[8]</sup>

## Conclusion

To our knowledge, this is the first cumulative review on the utilisation of DISs provided in India. In our review, we understood that the DISs is utilised in few hospitals, but the number is limited. Hence, there is a need to promote awareness regarding the services and it is recommended that every hospital have a DIC. Qualitative and quantitative assessment of DIS is essential in improving the overall performance of the service. By understanding the deficiencies in the services provided, we can overcome them and promote better patient outcomes. Since lack of awareness is one of the leading causes of irrational drug use, it could lead to therapeutic failure and ADRs, promoting DIS is essential in developing countries. The scope of DIS can be expanded in providing information about complementary and alternative medicine systems, providing TDM services, ADR detection and so on. Evidence-based medicine and rational use of drugs can be encouraged and promoted by training pharmacists and pharmacologists through offline or online outreach programmes.

## Acknowledgements

The authors would like to thank the staff of the Department of Pharmacy Practice, JSS College of Pharmacy, Ooty, for their constant support.

## Author Contributions

G. K. Sadagoban, Aiswarya Baiju, Samantha Sanjeev and M. Ayilya conceived the idea and designed the manuscript. Aiswarya Baiju, Samantha Sanjeev and M. Ayilya contributed to the collection of articles and were responsible for writing the manuscript draft. Swathi Swaroopa Borra was responsible for critically reviewing the manuscript. All the authors contributed substantially to the study conception, design, data interpretation, analysis and drafting of the manuscript. During revision of manuscript all authors provided their insights. The whole process was supervised by G. K. Sadagoban.

## Funding

This review received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## Conflict of Interest

The authors declare that they have no conflicts of interest to disclose.

## References

1. Nova Manosalva MA, Lópes Gutiérrez JJ, Cañas M. Drug information centres: an overview to the concept. *Rev Colomb Cienc Quím Farm* 2016; 45: 243–55. <https://doi.org/10.15446/rcciquifa.v45n2.59940>
2. Ahirwar CS, Mishra AK, Pathak AK. A need to be fulfilled: drug information services. *IOSR J Pharm* 2017; 7: 15–9. <https://doi.org/10.9790/3013-0706011519>
3. Ghaibi S, Ipema H, Gabay M; American Society of Health System Pharmacists. ASHP guidelines on the pharmacist's role in providing drug information. *Am J Health Syst Pharm* 2015; 72: 573–7. <https://doi.org/10.2146/sp150002>
4. Bright HR, Peter JV. Pattern of drug information queries in a South Indian tertiary care teaching hospital. *Indian J Pharm Sci* 2018; 80: 965–70. <https://doi.org/10.4172/pharmaceutical-sciences.1000446>
5. Chauhan NS, Raveendra R, Geetha J. *et al.* Drug Information Centre(DIC)-An Indian Scenario. *Indian J Pharm Pract* 2009; 2: 21–7.
6. Chandola A, Ratnakar, Kandari S, Joshi Y. Status of drug information centre and services in India: an overview and challenges. *Int J Pharm Sci Rev Res* 2020; 64: 60–4. <https://doi.org/10.47583/ijpsr.2020.v64i02.010>
7. Umashankar MS, Lakshmi KS, Kumar BA, Porselvi A. Review of the benefits of drug information centre services: a new transpiring practice to health care professionals in hospitals. *J Chem Pharm Res* 2017; 9: 28–38.
8. Patil AN, Padhy BM, Prasanthi SK, Rohilla R. Drug information center in India: Overview, challenges, and future prospects. *Int J Pharma Investig* 2018; 8: 1–6. [https://doi.org/10.4103/jphi.JPHI\\_103\\_17](https://doi.org/10.4103/jphi.JPHI_103_17)
9. George B, Rao PG. Assessment and evaluation of drug information services provided in a South Indian teaching hospital. *Indian J Pharmacol* 2005; 37: 315–9. <https://doi.org/10.4103/0253-7613.16856>
10. Patel H, Adepu R, Sapthagiri R, Gurumurthy P. Drugs and therapeutic information service provided by clinical pharmacists for an improved patient care: an experience from a tertiary care teaching hospital. *Asian J Pharm Clin Res* 2015; 8: 175–8.
11. Thireesha P, Mounika K, Kumar P, Sri Harsha C. An overview of drug information centre- functions and challenges in India. *Asian J Pharm Clin Res* 2020; 13: 11–5. <https://doi.org/10.22159/ajpcr.2020.v13i5.37052>
12. Graeme V. The society of hospital pharmacists Australia. International Register of Drug Information Services. August 2016. Available from: [https://www.shpa.org.au/default/files/uploaded-content/field\\_f\\_content\\_file/shpa\\_international\\_register\\_of\\_drug\\_information\\_services\\_2018.pdf](https://www.shpa.org.au/default/files/uploaded-content/field_f_content_file/shpa_international_register_of_drug_information_services_2018.pdf)
13. Rajanandh MG, Sreenivasan P, Ahalya SP, Anjali R. Assessment of pharmacists-led drug information service in a tertiary care hospital in India. *J Med Sci* 2017; 17: 102–6. <https://doi.org/10.3923/jms.2017.102.106>
14. Vishwanth J, Boyapally SK, Sodabattula M. Assessment and evaluation of drug information services provided by department of pharmacy practice based on enquirer's perspective at tertiary care hospital, Kalaburgi. *J Pharmacovigil* 2020; 8: 280. <https://doi.org/10.348/2329-6887.20.8.280>
15. Kumar SV, Chakilam V. Quality of services provided by drug information centre of the pharmacy practice department in tertiary care teaching hospital at Warangal District: Andhra Pradesh, India. *Indian J Hosp Pharm* 2012; 49: 151–6.
16. Rajanandh MG, Varghese RU, Ramasamy C. Assessment of drug information services in a South Indian tertiary care hospital in Kanchipuram district. *Int J Pharm Sci* 2011; 3: 273–6.
17. Kumar MM, Sowmya B, Dinesh R. *et al.* Evaluation of performance of drug information centre providing quality of information services to healthcare professionals in a tertiary care teaching hospital in South India. *Inov Pharm Pharmacother* 2013; 1: 81–90.
18. Krishnaveni K, Kameswaran R, Sumitha SK, Sajan AS. Assessment and evaluation of drug information services provided by a drug information centre at a multispeciality hospital in Erode, Tamil Nadu, India. *Int J Basic Clin Pharmacol* 2018; 7: 1987–90.
19. Praveen KM, Umme A, Zaibunnisa FF. *et al.* A study on assessment and evaluation of drug information service (queries) in a tertiary care co-operate hospital. *Int J Pharmacol Clin Res* 2018; 2: 19–23.
20. Malik KM, Malik BR, Sundaran S. Evaluation of drug and poison information services in a secondary care hospital and community pharmacies in Ooty. *Pharmacologyonline* 2009; 3: 624–40.
21. Jeevangi VM, Patil N, Gene AB. *et al.* Assessment and evaluation of drug information service provided by Pharmacy Practice department on enquiries perspective. *Int J Basic Clin Pharmacol* 2012; 3: 193–9.
22. Pradeep P, Varma AS, Mounika S. *et al.* Retrospective study to analyse and evaluate drug information query services provided by clinical pharmacist at a tertiary care teaching hospital. *Pharm Innov* 2015; 4: 36–9.
23. Jimmy B, Jose J, Rao PG. Short communication: pattern of adverse drug reaction related queries received by the drug information centre of a tertiary care teaching hospital. *Pak J Pharm Sci* 2007; 20: 333–9.
24. Lauer AK, Lauer DA. The good doctor: more than medical & knowledge and surgical skill. *Ann Eye Sci* 2017; 2: 36. <https://doi.org/10.21037/aes.2017.05.04>
25. Khatiwada AP, Shakya S, Shrestha S. Paradigm shift of drug information centres during the COVID 19 pandemic. *Drugs Ther Perspect* 2020; 36: 389–95. <https://doi.org/10.1007/s40267-020-00757-3>