Development of a Radiopharmaceutical Information Database

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Objective: This article describes the development of a radiopharmaceutical (RP) computer database. Development and implementation of the database and services provided are presented.

Methods: A commercial database program was used to develop the structure for a radiopharmaceutical information database (RID) and to classify interaction information into several categories. The database is accessible to a variety of users through a network server.

Results: Information entered into the RID may be accessed easily and rapidly. The RID provides a wide spectrum of information services to its customers.

Conclusion: The RID described is the first attempt to develop a database capable of entry and retrieval of RP information in an efficient and timely manner. The database is easy to use and maintain, and has virtually unlimited storage space on a network drive.

Key Words: radiopharmaceutical information database; radiopharmaceutical interaction; artifact; drug information

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Radiopharmaceutical (RP) information centers are needed because of the increased use of RP agents for patient care, the recognized interaction of these agents with conventional pharmaceuticals, the potential for unanticipated RP biodistribution patterns and imaging artifacts, and the lack of consistently available sources from which nuclear medicine professionals can obtain accurate and unbiased RP information. This need prompted the development of the first international Radiopharmaceutical Drug Information Center (RDIC) through a joint project between the University of Kansas Medical Center and the University of New Mexico. This RDIC has been in operation since April 1997.

One of the first operational issues that the RDIC faced was developing a strategy for efficiently searching and retrieving published RP information. Currently available databases (e.g., Medline, International Pharmaceutical Abstracts) were limited by a variance in searching terms and superficial indexing. By September 1997, the RDIC concluded that an internal computer database was required to enter, store and retrieve published RP information, for example information on drug-radiopharmaceutical interactions (a frequent request). This article describes the phases of development, implementation and the services provided by the RDIC.

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MATERIALS AND METHODS

The first phase of the RID involved surveying database end users, including nuclear pharmacy and drug information center personnel. The survey was administered during staff meetings and during one-on-one interviews. The results of the survey revealed that the RID must be capable of data entry and retrieval of RP information, readily accessible to the drug information and nuclear pharmacy staffs, easy to operate for the relatively inexperienced computer user, and possess virtually unlimited storage capacity for RP information. Security of the database also was an important requirement.

A review of commercial database software for the RID revealed none that specifically met the above criteria. The next step involved evaluating the available database software to create the RID. Microsoft® Access (Microsoft Corp., Seattle, WA) was selected due to its superior security features and ease of use for the end user of the RID. The Microsoft Access RID provided the advantage of a customized database to meet the RDIC's specific criteria requirements, but had the inherent disadvantage of significant development time required for the RID.

When the Access database is opened, 6 tabbed folders appear (Fig. 1). These are designed to develop a database to run specific Access commands (Table 1). Access forms were used for entering and searching for information. Access form drop-down boxes feature the ability to enhance the continuity of information entered for later database searches (Fig. 2).

As a result of the survey of pharmacy personnel, criteria were developed for fields within the Access RID forms. Access form fields are included in Table 2.

RP information must be entered into the RID using a specific format to ensure consistency for later RP information searches. The RID fields ''Drug Class,'' ''Clinical Problem Type'' and

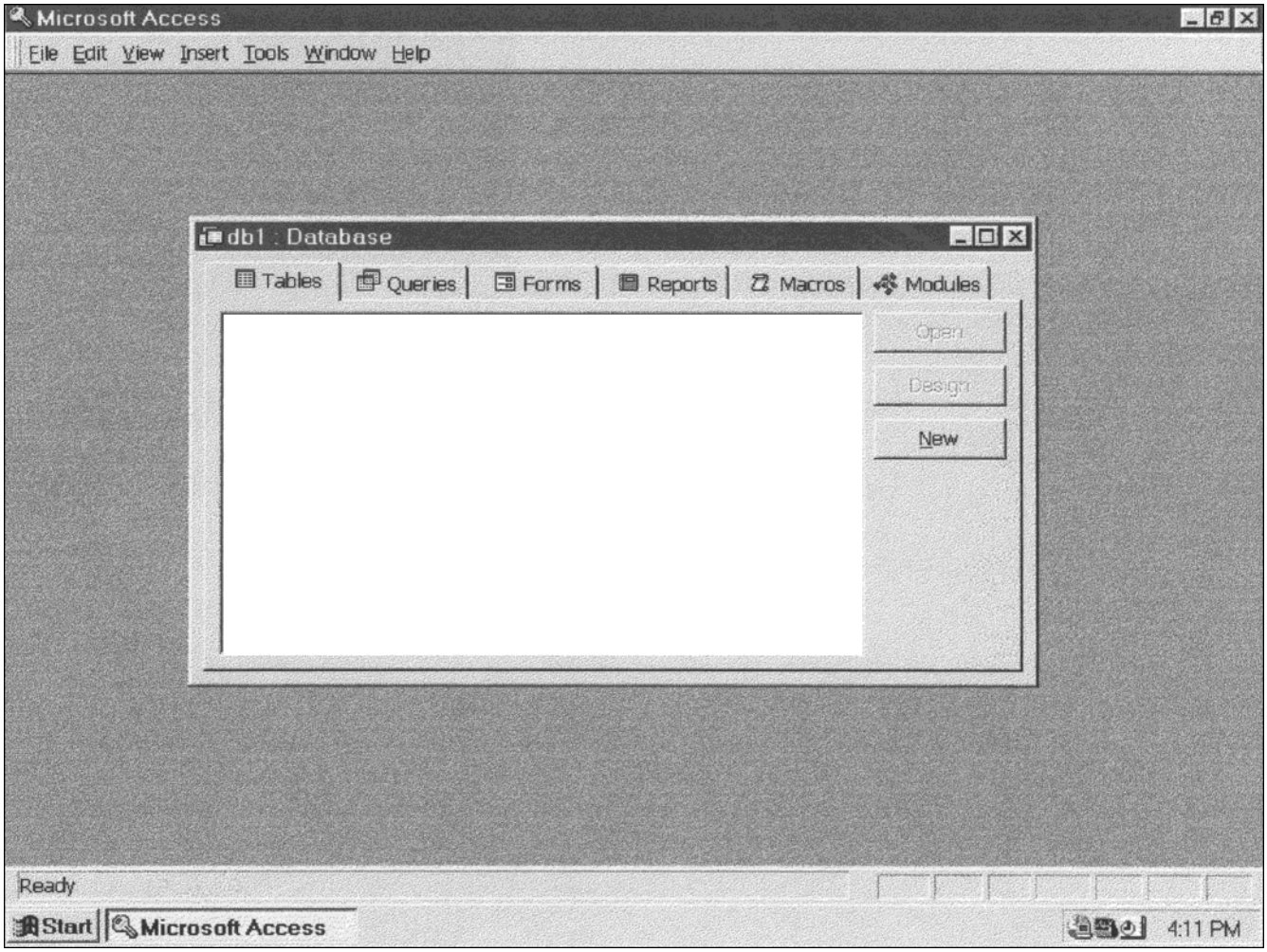

FIGURE 1. Microsoft® Access database screen with 6 folders.

''Radiopharmaceutical'' are important search fields where information is entered using fixed-entry tables linked to dropdown boxes in forms for consistency and to enhance later search capabilities. The article abstract is entered in free-text form in the ''Mechanism'' field, allowing unlimited text entry. ''Citation'' information was broken down into author, journal, title, year of publication, volume and article format fields to allow additional flexibility during RP information searches. Since several people enter information into the RID, a standard operating procedure was developed for entry and retrieval of RP information to limit the required computer skills and personnel training required to access and run the RID.

TABLE 1
Microsoft® Access Folder Description

Folder	Function
Tables	Store information
Queries	Retrieve stored information
Forms	Enter or retrieve stored information
Reports	Print out information
Macros	Specify database commands
Modules	Conduct written Microsoft Access commands

RESULTS

To search for RP information in the RID, key terms are selected in the Microsoft Access RID form, then a subsequent search filter is applied. RP information records are retrieved and displayed 1 record at a time or all retrieved records may be printed to hardcopy. An Access form search allows point-and-click capability and quickly narrows the search process. While the primary search fields include ''Drug Class,'' ''Clinical Problem Type'' and ''Radiopharmaceutical,'' all the form fields in the RID may be searched except the ''Mechanism'' field due to formatting of the field to memo text.

Information entered into the RID is stored in the Access database table and given a permanent record entry number. The permanent record number is handwritten and circled on the upper portion of the hardcopy information source. The information source then is filed sequentially for later retrieval of further information or request from callers for an original source.

DISCUSSION

The RDIC can provide a wide spectrum of information services to its customers, including but not limited to the topics

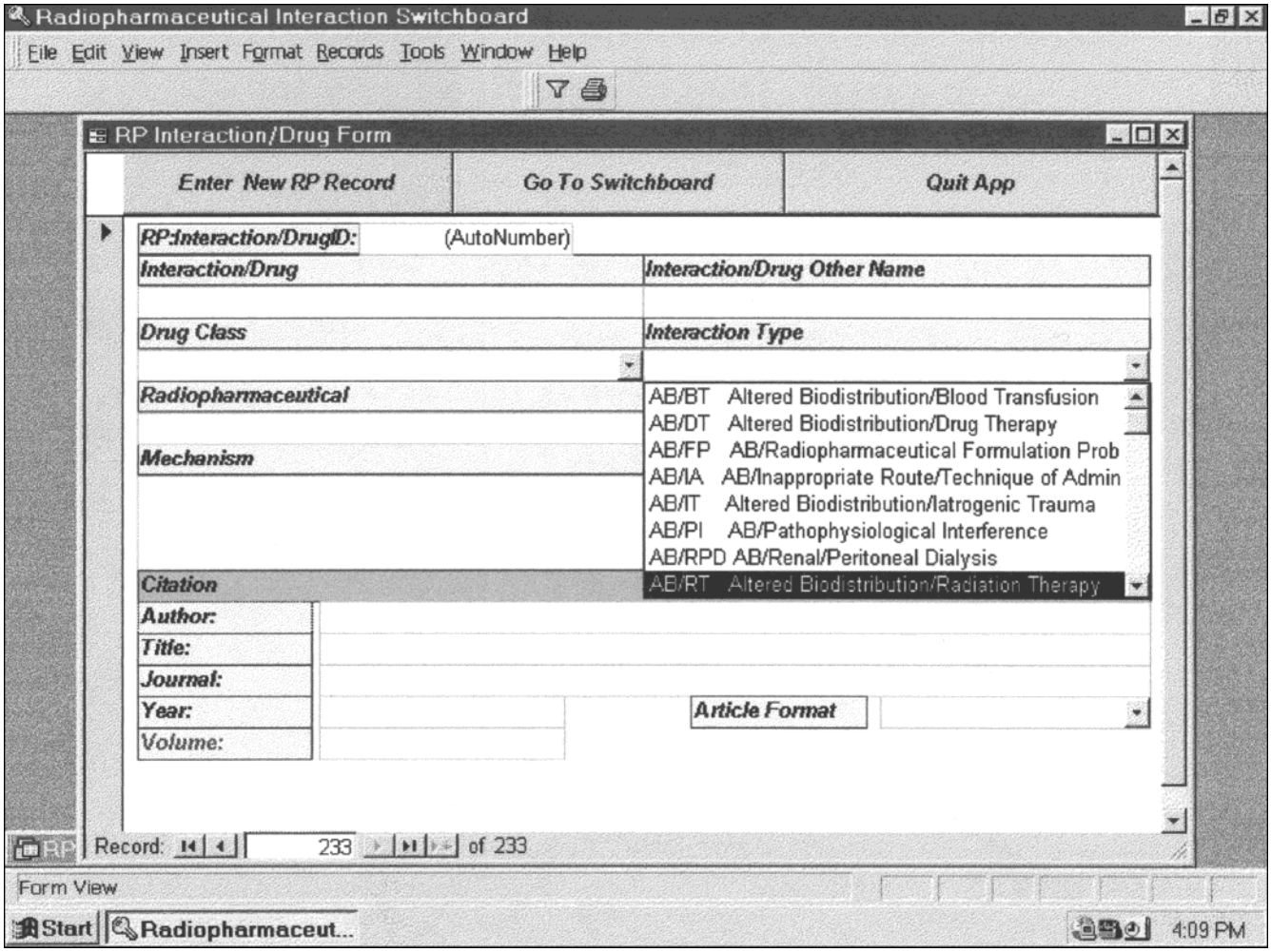

FIGURE 2. Microsoft® Access form with dropdown box.

in Table 3. The RDIC is operated in conjunction with the Drug Information Center. The RDIC's hours of operation are 8:00 am–6:00 pm CST, Monday through Friday. The center may be contacted by telephone at 913–588–2328 or by e-mail at druginfo@kumc.edu. In addition, requests may be sent to the through a web page at http://www2.kumc.edu/druginfo/radio.html. After hours and weekend requests for RP information are recorded by phone message machine. Requests for RP information begin to be processed the business day after their receipt. Requests must include the information given Table 4 to ensure an effective and timely response.

CONCLUSION

The RID is the first attempt to develop a computerized database specifically for RP information and capable of entry and retrieval of RP information in an efficient and timely manner. The database is easy to use and maintain, and possesses

TABLE 2
Microsoft® Access Radiopharmaceutical Information Database Form Fields

Field	Criteria
Clinical problem/drug	A description of the problem encountered/reported (e.g., drug-radiopharmaceutical interaction, altered biodistribution from other causes, adverse reaction) or the generic name of the drug or medication interacting with the radiopharmaceutical. Entries with more than 1 drug or medication may be entered as the brand name.
Clinical problem/drug other name	An additional name for the problem encountered or generic name of the drug or medication.
Drug class	AHFS category for the drug or medication.
Problem type	A nationally recognized system for classification of problems is used (*1*).
Radiopharmaceutical	Radiopharmaceutical involved in the reported problem. Radiopharmaceuticals are entered into Microsoft Access tables for selection by dropdown box in Access forms.
Mechanism	The mechanism of the reported problem. A short abstract of the publication is entered in free-text form.
Citation	Citation information is entered into 6 fields.

TABLE 3
Radiopharmaceutical Drug Information Center Topics

Medication-radiopharmaceutical interactions
Effects of various disease states on nuclear medicine study outcomes
Radiopharmaceutical-radiopharmaceutical interactions
Imaging artifacts
Other causes of unexpected nuclear medicine study outcomes
Adverse reactions to radiopharmaceuticals
Availability and clinical uses of radiopharmaceuticals
Physicochemical properties and pharmacokinetics of radiopharmaceuticals
Regulatory matters involving radiopharmaceuticals

virtually unlimited storage space on a network drive. Improvements will continue to be made to the RID to provide timely and accurate RP information for RDIC customers. The RDIC welcomes inquiries from nuclear medicine professionals all over the world.

TABLE 4
Required Information for Radiopharmaceutical Information Database Inquiries

Name of the radiopharmaceutical
Purpose of the radiopharmaceutical scan
Problem(s) associated with the scan
Patient's complications (disease states, drug allergies, etc.)
Patient's current medications
Requestor's name and location
Requestor's e-mail address, telephone and fax numbers

ACKNOWLEDGMENTS

Figures 1 and 2 are printed with permission from Microsoft Corporation.

REFERENCE

1. Hladik WB, Norenberg JP. Problems associated with the clinical use of radiopharmaceuticals: a proposed classification system, and troubleshooting guide. *Eur J Nucl Med.* 1996;23:997–1002.