AmbCare©—A Relational Database for Implementing a Community Pharmacy Ambulatory Care Teaching Program: A Descriptive Report1,2

Edward O. Magarian and Charles D. Peterson
College of Pharmacy, North Dakota State University, P.O. Box 5055 Fargo ND 58105

AmbCare©, an IBM compatible information storage and retrieval software program, was developed to support an eight-week community pharmacy ambulatory care clerkship for entry level doctor of pharmacy students. AmbCare© assists students in evaluating and identifying patients for possible health and medication problems which may need medical follow-up. AmbCare© supports students in performing patient risk factor assessment, drug therapy monitoring, and health condition monitoring and screening. The AmbCare© program assists both pharmacy practitioners and pharmacy students in the development and implementation of a pharmaceutical care education program in a community-based pharmacy setting. It also offers community pharmacy practitioners new monitoring techniques, new services, and new educational programs to offer its patients which focus on monitoring and improving patient outcomes. In addition, AmbCare© assists community pharmacy in satisfying the new federal requirements imposed by the Omnibus Budget Reconciliation Act of 1990. AmbCare© is currently being used by nine community pharmacies across the State for collecting research data on evaluating the appropriateness of drug use in North Dakota.

INTRODUCTION
North Dakota State University College of Pharmacy has developed an eight-week community pharmacy ambulatory care clerkship as an experiential program requirement for entry-level doctor of pharmacy students. This program provides an educational model for training both pharmacy students (herein referred to as student) as well as pharmacy practitioners (herein referred to as practitioner) in the delivery of pharmaceutical care in a community-based pharmacy setting. An essential component of this ambulatory care program is AmbCare©, an IBM-compatible computerized patient information storage and retrieval system, which was developed using Paradox®, a relational database software program. The utility of AmbCare© is not limited to its value as an educational tool, but may also be utilized by community pharmacists to monitor and document drug therapy interventions, outcomes, and patient counseling activities. AmbCare© has three major components: (i) health risks assessment; (ii) drug therapy monitoring; and (iii) health condition monitoring and screening. Each of these patient assessment features is driven by user-friendly menus. As part of their patient monitoring and screening activities, students measure blood pressure, blood cholesterol, and blood glucose. AmbCare© evaluates test results based on published criteria and formulates recommendations for guiding student and preceptor interventions and referrals to physicians. In addition, students can enter future contact dates for all patients requiring special follow-up concerning medication or health-related problems. Memo fields allow students to record detailed comments or explanations of the reasons for follow-up. AmbCare© can provide a listing of patients scheduled for follow-up within a time frame specified by the practitioner/student. The many features of AmbCare© are described herein. Various tables within AmbCare©, illustrated in Figures 1-23 utilizing black and white reproductions of actual color screens.

FEATURES OF AMBCARE© PROGRAM
Demographics. The student first enters patient demographic information in the demographics table (see Figure 1). A patient identification number (ID#) is sequentially generated by the computer for each new patient entered into the database. The patient identification number serves to: differentiate between patients (especially those with the same last name); keep track of a perpetual inventory or total number of patients monitored by the program; and assist in...
retrieving information on former patients. Other demographic information recorded on patients include: code name of the pharmacy (important when compiling aggregate study data from multiple teaching sites); date of patient visit; name, address, phone number, birth date, and sex of the patient; (age and gender information are used for the risk factor assessment); the name and address of the patient’s primary care physician (used for follow-ups, medical referrals, interventions and establishing goal of therapy); drug allergies; and documentation that the patient has signed the informed consent. Two consent forms are used for patients participating in the program(1). The first is an informed consent which is obtained to receive written permission from the patient to perform the health screening portion of the program (blood pressure, blood cholesterol, and blood glucose measurements) and to evaluate their test results and medication profiles to determine if any health problems or medication problems exist. The second consent obtained on each patient is the “Patient Release of Information” which gives written permission from the patient to follow-up with the patient’s primary care physician on any health or medication problems which are identified.

HEALTH RISKS ASSESSMENT

Identifying High Risk Patients. The first patient assessment feature of the AmbCare© program is the risk factor assessment option (see Figure 2). A series of questions are prompted by the computer and are used to determine those patients at high risk for developing health problems and/or medication problems. Patients are considered at high risk if they have one or more of the following risk factors(2): (i) patients with three or more medical conditions; (ii) patients with a history of multiple and/or frequent physician visits or hospitalizations; (iii) patients with two or more prescribers; (iv) patients who receive their prescriptions from two or more pharmacies; (v) patients who have poor medication compliance: (vi) patients receiving five or more prescription drugs concurrently; (vii) patients who have four or more changes in their prescription drugs per year; (viii) patients who take 12 or more doses of drugs per day; (ix) patients taking four or more OTC drugs concurrently; (x) patients with a history of side effects and/or hypersensitivity reactions to medications; and (xi) patients who are taking drugs which require therapeutic drug monitoring.

Frequency of TDM Monitoring. As part of the risk factor assessment, patients taking medications which require therapeutic drug monitoring (TDM) are screened by the computer for lack of follow-up monitoring (see Figure 3). A series of questions are prompted by the computer which quiz the patient to the last time a blood level was checked for TDM drugs (i.e., anticonvulsants, antiarrhythmics, digoxin, and theophylline). In addition, patients taking diuretics are assessed for frequency of serum potassium monitoring, patients taking warfarin are assessed for frequency of International Normalized Ratios monitoring, patients taking synthroid are assessed for frequency of T3/T4 monitoring, and patients, over 65 years of age taking ACE inhibitor are assessed for frequency of serum creatinine monitoring.

The AmbCare© program is preprogrammed with desired monitoring frequencies which defines the appropriate monitoring frequency for each blood level indicator. Once the practitioner/student enters the number of months that has elapsed since the patient’s last blood level, the computer evaluates this entry and compares it to the pre-established value or desired frequency of monitoring value for that specific indicator and identifies potential lack of monitoring occurrences. When the computer recognizes a discrepancy between the actual monitoring frequency and the desired monitoring frequency a message screen appears which alerts the practitioner/student as to the action that should be taken. For example in monitoring diuretic therapy, if a patient’s last potassium level was checked 18 months ago, the computer would compare this to the preprogrammed value of twice per year as the desired frequency of monitoring for potassium. A message screen would then come up which states: “Usually a serum potassium is recommended two times per year in patients taking diuretic therapy. Please contact your doctor for his/her advice or recommendation in obtaining a serum potassium level for monitoring this medication.” In addition to suggesting to the patient to contact their doctor for advice, the practitioner/student is instructed to follow-up directly with the prescriber to recommend the appropriate blood level monitoring. The desired monitoring frequencies for TDM drugs are determined by a physician consultant to the program or the primary care physician according to the specific needs of the patient.

OTC Drug Assessment. As part of the risk factor assessment, the AmbCare© program also queries the practitioner/student on assessing the patient’s usage of over-the-counter
(OTC) medications. The name, number, type, frequency, and purpose of OTC medication usage are recorded and assessed for appropriateness and problem areas. If the patient is taking OTC medications, the practitioner/student makes an assessment to determine if: (i) the patient understands how to take the OTC medication appropriately and confirms that the patient is taking them for the correct purpose and in the correct dosage; (ii) the patient is experiencing any side effects and/or has had any bad experiences with OTC medication usage; (iii) there are any drug interactions with prescribed medications (i.e., aspirin and warfarin); and (iv) there are any drug/disease state contraindications which may preclude their safe use of OTC medications (i.e., sympathomimetic decongestants and concomitant hypertension or acetaminophen and hepatitis).

Monitoring and Follow-up of High Risk Patients. The risk factor assessment portion of the AmbCare© program helps the practitioner/student identify those patients at high risk of developing health problems and/or medication problems who may require more intensive counseling, monitoring, and follow-up of their drug therapy. Patients identified at high risk receive: (i) a complete medication profile review to identify any possible drug therapy problems; (ii) extensive patient education counseling to enhance their understanding of their health condition(s) and medication(s); and (iii) close monitoring and follow-up of both their health condition(s) and medication(s). Identifying patients at risk helps determine which patients need close monitoring and follow-up on their medications and health conditions.

DRUG THERAPY MONITORING

Medication Profile. This feature allows the practitioner/student to establish a medication profile by entering all medications prescribed for this patient (see Figure 4). A series of questions are prompted by the computer and are used to establish the medication profile on each patient. The medication profile includes information on each medication regarding: name of the medication; purpose of the medication; dosage strength; total number of doses dispensed; number of doses taken per day; prescribers name; and an assessment to determine if either the physician or the pharmacist has properly counseled the patient regarding appropriate medication use (did the patient receive counseling and written information). Also an assessment is made as to the patient’s understanding of their health condition(s) to determine if there has been appropriate verbal or written information given to the patient related to their disease state.

Initial Fill vs. Refill vs. No Fill. AmbCare© differentiates the drug therapy monitoring needs of patients for those receiving newly prescribed medications vs those receiving continued therapy (see Figure 4). If the patient has not received the medication before, the medication is entered as an “initial fill.” This indicates to the practitioner/student that the patient has not had prior experience with the medication and that close attention is needed to ensure that the patient receives appropriate counseling regarding proper use of their new medication and also to ensure that the patient receives a follow-up phone call at home within 3-5 days of initiating therapy to determine if any problem areas exist (i.e., noncompliance, lack of response to therapy, side effects). The practitioner/student during these follow-up phone calls confirms that the patient understands how and when to take their medication(s) including the purpose and directions for use and also determines if the patient has any questions or problems concerning their newly prescribed medication(s). If the patient has been taking the medication before, the medication is entered as a “refill.” For all refill entries, the practitioner/student performs an assessment via AmbCare© of: (i) patient medication compliance; (ii) patient perceptions regarding their medication(s); and (iii) adverse drug reactions. In situations where the patient is currently taking medications which have not been filled by that particular pharmacy, AmbCare© allows the practitioner/student to record those medications the patient has received elsewhere (i.e., another pharmacy, physician samples) by entering the medication as a “No Fill.” This feature is important so that the practitioner/student receives a complete medication history on each patient so that appropriate medication counseling, drug therapy monitoring, and patient follow-up can be performed on all medications prescribed. In addition, with each patient visit the medication profile is updated which includes adding any new medication prescribed and/or discontinuing any medications which the patient is no longer taking. The computer prompts the user “Would you like a list of Patient’s Current
Medications?” which allows for the current medication profile to be reviewed and edited if necessary. Medication status is indicated as either “A” for active or “D” for discontinued. The medication table includes the patient demographic information which is automatically filled in from previous entries.

**Medication Compliance.** A standard feature of AmbCare© for the drug therapy monitoring portion is an assessment or evaluation by the computer of the patient’s medication compliance (see Figure 5). The patient’s medication compliance rate is automatically calculated by AmbCare© during each prescription refill by the following formula: (number of doses dispensed at the last refill/number of doses taken per day/total days since last refill) X 100 to determine the percent compliance(3). Since optimal compliance is considered as > 80 percent(4,5), AmbCare© is preprogrammed to flag any patient whose medication compliance rate is less than 80 percent. Patients who have medication compliance rates of less than 80 percent are considered to be at risk for: uncontrolled disease, frequent physician visits and hospitalizations, and prescriber changes in medication regimen (i.e., increases in drug dosages or adding other drugs to the regimen)(6). AmbCare© alerts the practitioner/student with a message screen if the patient compliance rate is poor to ensure that appropriate action is taken for noncompliance. The practitioner/student is instructed to provide extensive patient education counseling regarding the appropriate use of their medication. The recommended patient education strategy includes giving the patient a detailed description of their medical condition, the risks and complications of uncontrolled disease, as well as information stressing the purpose and benefits of their medication(1). The practitioner/student is further instructed to monitor the patient’s health condition closely for uncontrolled disease as well as watch closely for any changes made by the prescriber in the patient’s drug therapy. If poor compliance continues to be a problem for the patient despite extensive educational efforts by the practitioner/student, the patient’s physician is contacted to alert him/her that the patient’s medication compliance is low. The practitioner/student is further instructed to advise the physician to monitor the patient’s disease state and drug response closely during this noncompliance period and to caution the prescriber in increasing drug dosages or adding other drugs to the regimen until the compliance problem can be corrected.

**Patient Perceptions.** An additional assessment feature of the drug therapy monitoring portion of the program is an evaluation of the patient’s perceptions about their medication(s)(7,8) (see Figure 5). A series of questions is prompted by AmbCare© to identify if the patient “likes” or “dislikes” their medication(s) and why. Patients are also asked if they feel that their medications are helping them or not (i.e., working well, partially working, or not working at all). Also patients are asked if they are experiencing any side effects or having any “bad” experiences with their medications. If the patient expresses negative perceptions about their medications the practitioner/student is instructed to monitor medication compliance and patient drug response closely. The practitioner/student is further instructed to provide positive reinforcement and encouragement to the patient regarding the importance of their medication to their health and also stress the potential benefits of the medication(s) to the patient.

**Documenting Problems and Interventions.** The drug therapy monitoring portion of AmbCare© also includes a table to document drug therapy problems that have been identified
for each of the prescribed medication being taken by the patient (see Figure 6). Drug therapy problems which can be documented include: drug-drug and drug-food interactions; drug allergies; therapeutic duplication; incorrect duration; drug-disease contraindications; clinical abuse or misuse; incorrect or no drug indication; incorrect dosage; polypharmacy; adverse drug reactions; and lack of drug monitoring. Practitioner/student interventions with the patient and/or prescriber can be recorded to document any drug therapy changes made. A memo field is available to provide the practitioner/student with the opportunity to enter a detailed narrative regarding the specific intervention(s) and recommendations made.

Adverse drug reactions are documented in AmbCare© according to the following organ system approach (Figures 7 and 8): central nervous system; genitourinary, gastrointestinal, skin, cardiac, respiratory, and EENT. A menu driven list of common adverse drug reactions for each of the specific organ systems is provided by computer to be chosen by the practitioner/student (see Figure 9). This approach provides consistency and standardization in documenting adverse reactions especially when numerous medical terms are used to describe the same medical condition (i.e., pruritus vs. itching and drowsy vs sedated). Users are allowed to select from the list of adverse drug reactions provided by the computer or enter their own under “other” for each category. This strategy becomes useful in retrieval and analysis of aggregate data obtained from multiple user sites for conducting clinical research.

**Laboratory Monitoring.** AmbCare© also allows the practitioner/student to record important laboratory data to assist in the process of monitoring the patient’s drug therapy and disease state (see Figure 10). The practitioner/student obtains a list of laboratory tests that have been ordered by the physician for each patient visit and then records the results of those tests which are important in monitoring the patient’s disease state and drug therapy. Laboratory tests available in AmbCare© for drug and disease state monitoring include: drug levels (17 drugs in total); electrolytes (sodium, potassium, chloride, calcium, phosphate, and magnesium); renal function (serum creatinine, BUN, and creatinine clearance); liver function (AST/SGOT, ALT/SGPT, albumin, bilirubin-total, bilirubin-direct); pulmonary function (peak flow, FEV-1, FVC, FEV-1/FVC and percent decrease in peak flow, FEV-1, and FEV-1/FVC); blood chemistry (Hgb, Hct, RBC, WBC with differential, International Normalized Ratio, platelet count, and ESR); and culture and sensitivity (culture source, organism(s) isolated, and antibiotic sensitivity). AmbCare© is programmed with normal values...
for each laboratory test so that the practitioner/student can become familiar with individual laboratory tests and determine what is “normal” vs “abnormal.” AmbCare© evaluates the laboratory test result entered for each patient based on the preprogrammed normal values and immediately alerts the practitioner/student via a message screen if the patient’s laboratory value falls outside the normal range (see Figure 11 and Figure 12). The practitioner/student can then contact the physician to determine if this “abnormal” laboratory value is acceptable to the physician and determine the proper course of action to be taken. The practitioner/student can enter a laboratory value that the physician finds acceptable or desirable for this patient. This value is then used as the standard for that patient to which future test results are compared. This laboratory monitoring feature can be used by community pharmacies to monitor the efficacy and toxicity of drug therapy including but not limited to: International Normalized Ratio for warfarin therapy, potassium for diuretic therapy, cultures and sensitivities for antibiotic therapy, drug blood level monitoring, pulmonary function for bronchodilator therapy and asthmatics, drug dosage adjustments in patients with renal failure, blood counts for chemotherapy, blood chemistries for treatment of anemia, acetaminophen use and hepatotoxicity, lack of laboratory monitoring, as well as other important indices. Practitioners/students obtain laboratory test results from any of the following sources: (i) from the patient if hard copies of laboratory data are available; (ii) by telephoning the primary care physician and/or laboratory directly; or (iii) by faxing the laboratory data from the medicine clinic to the pharmacy. In the future, a direct modem hook-up with the physician’s office computer is planned to allow for an exchange of information between the pharmacy and clinic regarding medications and laboratory results.

Establishing Therapeutic Goals. AmbCare© provides a feature which allows the practitioner/student to document and record the specific therapeutic goal for each medication prescribed for conditions such as hypertension, hypercholesterolemia, and hyperglycemia (see Figure 13). The therapeutic goal for each medication can be obtained from the prescriber and then entered into the computer for assisting the practitioner/student in monitoring patient drug response. The computer then utilizes this information in evaluating the degree to which each medication is achieving the desired goal of therapy. This feature allows the practitioner/student to identify those patients who have made minimal to no progress with their medications in achieving the therapeutic goal. The practitioner/student can then follow-up with the prescriber on these therapeutic failures to
Discus alternative drug therapy options.

**Documenting Therapeutic Outcomes.** A unique feature of AmbCare© is the opportunity to document therapeutic outcomes (see Figure 14). This feature allows the student/practitioner to record the specific therapeutic outcomes achieved for each medication prescribed. Therapeutic outcomes which can be recorded relating to the patient's drug therapy include but are not limited to the following (see Figure 15 and Figure 16): health condition (options: improved, prevented, controlled, eliminated, and other); side effects (options: increased, continued, decreased, eliminated, and other); drug allergy (options: increased, continued, decreased, eliminated, and other); medication compliance (options: increased, decreased, and other); number of medications (options: increased, decreased, all prescriptions discontinued, and other); response to medication (options: no, poor, good, and other); and cost of medication (options: increased, decreased, and other). The documenting therapeutic outcomes feature of AmbCare© is important in assisting community pharmacies in monitoring the patient's response to drug therapy as well as documenting the impact of pharmacist interventions on patient outcome. This information could possibly be used by community pharmacies for providing documentation to third party payers to help justify reimbursement for pharmaceutical care services.

**Satisfying OBRA.** Ambcare© also assists community pharmacy in satisfying the new federal requirements imposed by the Omnibus Reconciliation Act of 1990 (OBRA'90) (9-11) (see Figure 17 and Figure 18). Specifically, Ambcare© provides a check-list of OBRA'90 requirements for patient education counseling which provides practitioners and students with a mechanism for documenting what specific medication-related information has been given to the patient for each medication prescribed. In addition to the check-list, Ambcare©© also allows the practitioner/student to provide a detailed narrative related to any special information or issues discussed with the patient regarding their medications and/or disease state. This feature ensures that the practitioner/student covers the major areas of information required by OBRA'90 and documents that patients have received appropriate counseling for each medication prescribed. The Ambcare© OBRA'90 medication counseling checklist includes but is not limited to the following information: name and description of medication; dosage form and dosage; how to administer; duration of therapy; special directions and precautions for preparation, administration, and use; common side effects and adverse reactions, therapeutic contraindications including: what they are, how
HEALTH CONDITION MONITORING AND SCREENING

Medical History. This portion of Ambcare© is used for: (i) obtaining a medical history of the patient on any previously diagnosed health conditions; (ii) screening patients for possible health problems that they may be unaware of at the present time; and (iii) monitoring the effectiveness, response to therapy, or patient outcomes to prescribed medication (specifically for hypertension, hypercholesterolemia, and hyperglycemia) (see Figure 19). Information collected in the medical history portion of Ambcare© includes a patient query as to: the name and number of medical conditions for which the patient is being treated (this is used in the risk factor assessment under multiple medical conditions); the patient's height and weight; whether the patient has been told by their doctor or other health professional that they have high blood pressure, high blood cholesterol, and/or high blood glucose (this is used for determining whether pharmacy identifies any new health conditions in the patient); and when the last time the patient has had their blood pressure, blood cholesterol, and blood glucose checked. If the patient is being tested for a blood glucose determination, the Ambcare© program prompts the user to perform an assessment of meal status to determine if the level being obtained is fasting or nonfasting (see Figure 20). The meal status information is used in evaluating test results and determining the need for medical evaluation. The Ambcare© program also prompts the user to perform an assessment of coronary heart risk factors before an assessment of the patient's blood pressure, blood cholesterol, and blood glucose are performed. The coronary heart risk factor assessment information is taken into consideration when making medical referrals (see Figure 20).

Evaluation of Test Results. Once the practitioner/student performs an assessment of the patient's blood pressure, blood cholesterol, and blood glucose values, the test results are evaluated by Ambcare© based on pre-established criteria(1) (see Figure 21). Once an evaluation of the health screening results has been completed, a message screen appears which instructs the practitioner/student on the appropriate course of action to be taken on the patient. If possible health problems or medication problems are identified, the patient is referred to their primary care physician to determine the need for further medical evaluation and treatment. Referral information is recorded including the name and address of the referral physician and the reason for the medical referral. The referral information is then used for entering future contact dates for patient follow-up to ensure that patients did in fact see their doctor for the health problem identified.

Future Contact Dates and Patient Follow-up. Ambcare© also allows the practitioner/student to enter future contact dates to follow-up with the patient regarding any drug therapy (see Figure 22) or health condition (see Figure 23) problem areas that have been identified. Each day/week the practitioner/student can query the computer to retrieve a list of patients who are scheduled for follow-up for various drug therapy and/or health problems. Ambcare© is preprogrammed for the following medication follow-up: prescription refill reminder [if the patient has not come in for a refill within seven days of the refill date the patient will be contacted by phone to see if there is a problem and to remind him/her that the refill is overdue]; initial fill, patients who receive new medications will be contacted within 3-5
days of the initial fill date to see if they are having any problems or have any questions regarding their medication(s) and also to ensure that they understand how to properly and safely take their new medication(s); allergic reactions, patients who have experienced a recent allergic reaction to their medication(s) will be contacted within 72 hours to determine if the allergic reaction has diminished or disappeared; medication compliance, if medication compliance is a problem (i.e., less than 80 percent) the patient will be contacted within seven days of the compliance evaluation to determine if the patient is still having problems taking the medication(s) as directed; TDM monitoring, if a patient is overdue for a blood level determination of a drug the patient will be contacted in 30 days to determine if he/she was compliant in seeing the doctor for follow-up of the appropriate test(s) needed for monitoring drug therapy [if not the physician will be notified to follow-up with the patient regarding the necessary test(s)]; adverse drug reactions, patients who have experienced a recent adverse drug reaction to their medication(s) will be contacted within 72 hours to determine if the side effect has diminished or disappeared [if not the physician will be notified regarding any further evaluation needed]; medical referral, patients who are referred for medical evaluation of a health problem and/or a medication problem will be contacted in 30 days to determine if they have followed-up with their primary care physician regarding the referral; change in directions, patients who have changes made in their medication regimen(s) will be contacted within 72 hours to determine if they are having any problems or have any questions concerning the new regimen and to ensure that they fully understand the new directions for use; poor response, patients who have been responding inadequately to their medication(s) will be contacted in 30 days to determine if there has been an improvement in their response to the medication; and other reasons for follow-up, contact schedules may be entered for any reason for which the patient may need follow-up.

SOFTWARE AND HARDWARE REQUIREMENTS

The basic software program is Paradox© 4.0 or 4.5 (Borland International) for DOS (3.0 or higher), a relational database with a programming language known as PAL - Paradox Application Language. PAL was used in developing Ambcare©, which contains over 1,300 files and requires about 12 megabytes of hard disk space to install. For the efficient execution of Ambcare©, the following hardware are recommended: a 386 or 486 (preferred) DX33 (or faster) CPU, Local Bus to Video and-if possible-Local Bus to Hard Drive, a VGA Color Monitor, 8 Megabytes of Extended Memory (16 Megabytes preferred), and a mouse - recommended, but not required. In addition, an internal tape drive is strongly recommended for periodic back-up of all patient data.

CASE STUDY

The following case is taken from a recent intervention made by a student utilizing Ambcare© at one of the College’s Community Pharmacy Ambulatory Care Training Sites and as an example of the positive impact that this program can have on assisting community pharmacy in monitoring drug therapy, documenting interventions, and improving patient outcomes and quality of life:

A 43-year-old obese diabetic patient with a history of alcoholism came into a local community pharmacy for a check of his blood glucose level. The pharmacy student on location performed the test via fingerstick and results revealed a blood glucose value of 454mg/dl. Upon further questioning, the patient admitted to being noncompliant with his diabetic medication (glipizide 5mg bid) and also complained of having symptoms of double vision even when sober. The patient also admitted to moderate alcohol consumption prior to his visit and he became somewhat agitated and upset when given his test results. Although the patient had signed both informed consent and patient release-of-information forms the patient did not want the student to contact his doctor regarding the test results. A complete history revealed that the patient was a truck driver who claimed that he would lose his job if these findings were disclosed. The student discussed the results with the patient and stressed the purpose and benefits of his medication on controlling his diabetes and also stressed the importance of taking it every day. The student also informed the patient of possible health-related consequences of uncontrolled diabetes and the impact that this could have later in life on his overall health and wellness. The student agreed not to contact his doctor initially provided the patient did the following: (i) stop drinking alcohol; (ii) start taking his diabetic medication; and (iii) return the next day for a morning fasting glucose. The patient came back to the pharmacy early the next morning and was waiting for the student to arrive at work. The patient was sober, had been taking his medication, and had fasted 12 hours to prepare for the tests. The student performed a fasting blood glucose at this time and obtained a level of 314 mg/dl. The patient was instructed by the student to continue taking his medication, to abstain from all alcohol consumption, and to return to the pharmacy in one week for a follow-up visit.

The patient complied with this request and at the one-week follow-up visit a fasting blood glucose level was performed by the student and was found to be 222 mg/dl. The patient was excited about his progress and now agreed to see his physician. The student contacted the patient's physician regarding the details of his findings and actions. The patient returned to the pharmacy two weeks later and said that he was now seeing his endocrinologist, was following a strict diet with a registered dietitian, and was taking his medication every day. The patient had the student check his blood glucose level at this time and found it to be 174 mg/dl. At the end of the student’s ambulatory care rotation (six weeks from the initial visit), the patient made a special trip back to the pharmacy to thank the student. He was excited to report to the student that he: had lost 20 pounds, had been totally abstinent from alcohol for the past six weeks, had a fasting glucose level of 85 mg/dl at his last clinic visit, and had been taken off all of his diabetic medication by the endocrinologist. His medication had been costing him $20/month or approximately $240/year. The patient thanked the student for caring about him, helping him to better understand his diabetes, and convincing him to do something about it.

SUMMARY

AmbCare© has been utilized since 1993 in nine community-based pharmacies throughout North Dakota participating in a required eight-week Ambulatory Care Clerkship for six-year entry-level Doctor of Pharmacy students. It has
served to: (i) support the education and training of both pharmacy students and pharmacy practitioners in developing and implementing pharmaceutical care in a community-based pharmacy setting; (ii) provide documentation of the impact of practitioner/student interventions on improving patient drug therapy and patient outcomes; (iii) provide documentation for soliciting third party reimbursement for pharmaceutical care services; and (iv) provide community-based pharmacies with greatly needed tools for performing patient health assessment, disease state and drug therapy monitoring, health screening, medical referrals, and patient follow-up.

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References