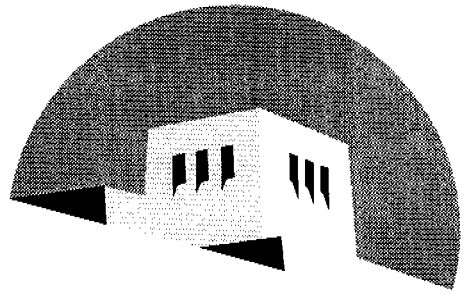

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Pharmaceutical Care: SOAPing a Consult in Diagnostic Imaging

by:

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PHARMACEUTICAL CARE: SOAPING A CONSULT IN DIAGNOSTIC IMAGING

STATEMENT OF OBJECTIVES

The primary purpose of this lesson is to provide a fundamental understanding of the development of a written consult to a health care provider. To accomplish this, the pharmacist must review patient data to determine what is to be included in the patient problem list. From this list, and from a knowledge of what diagnostic imaging procedure was ordered, the nuclear pharmacist will be shown how to make an assessment and a plan for the desired diagnostic/therapeutic outcome. Formulating a written response in **SOAP** (**S**ubjective Data, **O**bjective Data, **A**ssessment, **P**lan) form is essential for communicating with health care providers and will assist in reimbursement.

Upon completion of this article the reader should be able to:

1. define 'patient problem list.'
2. describe the components of a SOAP Note.
3. develop a problem list for a patient scheduled to undergo a diagnostic imaging procedure.
4. make an assessment of the patient's problem list, relative to the imaging procedure ordered.
5. determine if there is a potential for drug-drug interactions, drug-procedure interactions, etc.
6. write a pharmaceutical care plan recommendation in SOAP format.

COURSE OUTLINE

I. INTRODUCTION

II. THE PHARMACEUTICAL CARE APPROACH

III. EFFECTING PROACTIVE CHANGE

IV. PROBLEM LIST

V. SOAP NOTE

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- C. Assessment
- D. Plan

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- A. Consults Unrelated to Diagnostic Imaging
- B. Pharmaceutical Care and Diagnostic Imaging

VII. REIMBURSEMENT FOR COGNITIVE SERVICES

VIII. CONCLUSION

PHARMACEUTICAL CARE: SOAPING A CONSULT IN DIAGNOSTIC IMAGING

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INTRODUCTION

Surveys of nuclear pharmacists' attitudes toward their jobs and responsibilities document the potential untapped availability of the nuclear pharmacist as a consultant.[1,2,3] These studies demonstrated that the nuclear pharmacist is a team player willing to offer assistance but at the same time having a limited opportunity to do so. Of significance was the fact that professional interaction was the most appealing part of their practice. Rhodes et al. noted that regardless of the practice setting, nuclear pharmacists spend less than 20% of their time engaged in clinical activities.[3]

Historically, community and hospital pharmacists have been oriented toward the drug product with little or limited contact with patients and other health care professionals. Although nuclear pharmacists in the hospital/clinic setting have the potential for direct patient contact, the lack of published pharmacist-patient encounters suggest that this class of professional is also oriented toward the drug product. Consultant services that are offered in this environment are usually retrospective in nature. The nuclear pharmacist is consulted when a diagnostic imaging procedure goes awry and the possibility to affect a positive patient outcome has already passed. This type of interaction, although appreciated by practicing nuclear pharmacists,[1] does not have any direct, positive outcome on patient care. In addition, because of the timing of this intervention, it does not satisfy the definition of "pharmaceutical care" and does not qualify for reimbursement for the cognitive service.

THE PHARMACEUTICAL CARE APPROACH

Clinically involved pharmacists practicing in areas such as pharmacokinetics, nutritional support and some medical subspecialties have been making positive impact on patient care even before the term "pharmaceutical care" was ever used. Pharmacists who practice as drug information specialists or are actively involved in drug outcome evaluation (DOE) studies also serve as consultants, but their input in direct patient care has been somewhat distant.[4,5] However, the introduction of the "pharmaceutical care" concept by Hepler and Strand[6] and the attendant "Medication Related Problems" (MRPs) now allows the pharmacist to become a proactive member in the patient care arena. Some examples of MRPs based on this author's clinical experiences are illustrated in Table 1.

These examples are typical of what a pharmacist can find if the effort is made to search for MRPs. Therapeutic drug MRPs 1, 3, 4, 5, 7, and 8 were identified by pharmacists who then intervened and offered corrective solutions that were accepted. The diagnostic drug examples illustrate how easily the MRPs can be adapted to diagnostic drugs. The goal in diagnostic imaging is that the procedure must offer valuable information for the care of the patient. The pharmaceutical care approach should focus on MRPs that may produce a suboptimal test and ultimately a suboptimal patient outcome through delayed, absent or erroneous diagnostic imaging results.

In order to perform pharmaceutical care in the manner theorized by Hepler and Strand, patient specific information is required. This presents a problem for the nuclear pharmacist practicing in a centralized (commercial) nuclear pharmacy (CNP) or in the drug information center. It is probably this fact more than any other that has resulted in articles stating that the nuclear pharmacist is performing pharmaceutical care when drug distribution functions are performed correctly.[7,8] However, an acceptance by the pharmacist to assume responsibility for the outcome of the patient's drug therapy along with the proactive interaction with patients, physicians, nurses or other health care professionals is mandatory for the performance of pharmaceutical care. This interaction with a caring attitude and the ability to positively contribute to patient care, comprise the necessary ingredients of the pharmaceutical care process.

Demographically, patient contact is greatest in the community pharmacy or the ambulatory care clinic. It is less so in the CNP but with electronic means (e.g., fax, e-mail) it is still possible for the nuclear pharmacist, by obtaining patient specific information, to offer expertise to pharmacists or other health care providers in client institutions. The concept of "being there" will still be important and it behooves the nuclear pharmacist (academic and community) to explore avenues of communication with the medical staff. Attending and/or sponsoring grand rounds, tumor board, monthly department meetings, Pharmacy and Therapeutic Committee meetings, assisting in the design of imaging protocols, and rounding with pharmacist clinicians are some ways in which this can be accomplished.

From a practice perspective, it is impossible and perhaps unnecessary to offer pharmaceutical care for every patient undergoing a diagnostic imaging procedure, but selected patient data can be reviewed 1-2 days prior to the procedure to determine if intervention is necessary. Patients at risk, or whose disease usually presents with concurrent medical problems requiring treatment are prime candidates. Table 2 lists five major disease categories and nuclear medicine procedures commonly performed in these patients. In each disease category, imaging procedures are utilized to diagnose or stage disease, and/or evaluate the pharmacological and surgical treatments the patient has undergone. These types of patients/imaging procedures offer the most "fertile" ground in which to initiate the pharmaceutical care process.[4] Another approach would be to review patient specific data for patients undergoing procedures in which an MRP may place the patient at an additional risk. Table 3 lists some typical examples.

EFFECTING PRO-ACTIVE CHANGE

Communication, verbal and written, in the appropriate format is the essence of having a positive impact on patient care. In 1964, Lawrence E. Weed published the problem-oriented approach to patient care.[9] The pharmacist who is interested in practicing pharmaceutical care should be encouraged to adopt this method. Physicians approach the patient with this method and, when a pharmacist wants to communicate with a health care professional, adoption of Weed's method facilitates the process. Other pharmacist clinicians have modified this approach and have developed the FARM (Findings, Assessments, Recommendations or Rational,

Table 1

MRP	Therapeutic Drug Example	Diagnostic Drug Example
1. untreated indication	Patient with a history of hypothyroidism is admitted with pneumonia. Admission drug orders includes only a one time dose of thyroxine.	Cancer patient admitted with a chief complaint of increasing bone pain. Bone scan not ordered.
2. improper drug selection	Elderly patient admitted with a compression fracture, hypertension and dementia. Hypertension is adequately controlled with a calcium channel blocker and a vasodilator. Neurologist orders propranolol for "intention tremors." Blood pressure drops dramatically.	Patient with degenerative joint disease and arthritis is scheduled for a treadmill stress test.
3. subtherapeutic dosage	Female patient on vancomycin for abdominal abscess 10 days after a C-section. Peak concentration = 18.9 mg/mL and trough concentration = 3.5 mg/mL. Peak concentration is below accepted therapeutic levels.	Patient with Stage D hormone refractory prostate cancer and complete blood count within normal limits is scheduled to receive 2.0 mCi of ^{89}Strontium chloride for bone pain.
4. failure to receive drug	A patient's home medications are not prescribed correctly upon admission.	Patient with a thyroid nodule is scheduled for a T_3 suppression test. Prescription for tri-iodothyronine never filled.
5. overdosage	Elderly female with newly diagnosed gynecological cancer. Serum creatinine = 2.5 mg/L and calculated creatinine clearance = 16.6 mL/min. Patient is receiving ranitidine 150 mg po BID and cefuroxime 750 mg i.v. q8h. Pharmacist recommended ranitidine q24h schedule and a q12h schedule for the cefuroxime.	Patient with metastatic bone disease is scheduled for a ^{89}Strontinum chloride dose one week after chemotherapy. Blood count nadir has not been reached and a full dose of ^{89}Strontium will most likely cause a precipitous drop in the blood count.
6. adverse drug reaction	68 year old male patient is placed on vancomycin 1 Gm q12h and tobramycin 80 mg q12h after revision of a prosthesis. The patient developed a rash on the head and neck secondary to too rapid infusion of i.v. vancomycin.	Adult patient is injected with ^{99m}Tc medronate for a routine bone scan. Patient complains of itching and rash about 1.0 hour post injection.
7. drug interaction, food-drug interaction*	Two commonly prescribed oral antibiotics are ciprofloxin and ofloxacin. Both can be taken with food to decrease gastrointestinal distress, but antacids must be held for 2 hours after administration. These antibiotics also raise serum caffeine and theophylline levels.	Patient scheduled for persantine-thallium stress study at 0900, but had coffee and donuts at 0830. Patient is scheduled for an ^{131}I metaiodobenzylguanidine (MIBG) study to rule out a pheochromocytoma. The patient has a "cold" and is taking an OTC decongestant containing phenylpropanolamine hydrochloride.
8. drug use without indication	Elderly patient on gentamicin and ofloxacin for pseudomonal urinary tract infection. The patient continues to complain of right upper quadrant abdominal pain and a kidney-ureter-bladder (KUB) x-ray reveals calcification in the right kidney. Internal medicine physician adds the antibiotic cefotaxime.	45 year old male is scheduled for a ^{201}Tl chloride stress test to R/O ischemic heart disease. The patient is otherwise in excellent health and can easily perform on the treadmill. The patient is given dipyridamole as an alternative to the treadmill.

**Some authors have suggested that drug-drug and food-drug interactions may be the cause of a problem, but not the problem itself, i.e., a drug interaction may induce a subtherapeutic dosage, an overdosage, or an adverse drug reaction.*

Table 2

Acute and Chronic Disease States and Nuclear Medicine Procedures of Value for Management

Patient Problem		Imaging Procedure
1.	Coronary Artery Disease	Thallium Perfusion Imaging ^{99m}Tc-RBC MUGA
2.	Diabetes Mellitus	3(4) Phase Bone Scan ^{111}In or ^{99m}Tc Leukocyte Imaging
3.	Infectious Disease	^{111}In or ^{99m}Tc Leukocyte Imaging ^{67}Ga-citrate Imaging
4.	Oncology	Bone Scan Ventilation-Perfusion Imaging MoAb Imaging
5.	Hypothyroidism/Hyperthyroidism	^{123}I Uptake and Scan

Table 3

Typical Diagnostic Imaging Procedures with Potentially Significant MRPs

Nuclear Medicine Procedure	Monitor For
^{18}F-FDG Cerebral Perfusion	Blood glucose levels
Adenosine/Dipyridamole Cardiac Perfusion Studies	Diet: Caffeine containing products prior to study (coffee, tea, chocolate) Drug Therapy: Theophylline therapy for asthma, COPD, or other pulmonary condition, OTC analgesics containing caffeine
^{89}Strontium chloride/^{153}Samarium lexidronam for palliation of metastatic bone pain	When was last cycle of chemotherapy or radiation therapy? Has the nadir for patient's blood components been reached?
Hepatobiliary Imaging	Is patient npo? If so, for how long? If not npo, is patient eating solid food? Is patient receiving opioids for pain? Is patient receiving other GI drugs (e.g., metoclopramide) to increase GI motility?

Monitoring) notes and described in detail a systematic approach to solving MRPs.[10,11,12] Common to all these methods is the ***Problem List and SOAP Note***.

PROBLEM LIST

The *problem list* is composed of patient and health professional concerns. It can contain items in which there are surgical, pharmacologic or societal solutions. A typical problem list contains patient complaints, abnormal lab values, unusual physical findings, which will aid in the diagnosis and management of the disease. All too often, pharmacists will make judgments on a patient's list of medications without the assistance of a problem list for the patient. Only after the pharmacist has knowledge of the patient's working diagnosis and other related problems as documented in the problem list, will he or she be able to make judgment on potential or real medication-related problems. While the physician's use of the problem list usually involves reference to medical/surgical problems (e.g., diabetes mellitus, hyper-tension), this concept was used by Hepler and Strand in the development of the eight types of medication related problems that are listed in Table 1 with examples.

SOAP NOTE

Each professional who documents his/her care in the patient's medical record uses the problem-oriented SOAP Note as the method of communication. For each problem the **S**ubjective and **O**bjective data are recorded, an **A**ssessment performed, and a **P**lan formulated to correct the problem.

SUBJECTIVE (S) DATA

The subjective section contains patient complaints, along with appropriate observations from health care professionals. In a diabetic patient with a foot ulcer, the subjective note may read:

S: "My right foot is swollen and the sore will not heal." Compliant with insulin regimen, but does not follow diet and exercise recommendations.

In general, this data is not measurable or objectively verifiable. Subjective data is most often obtained by talking to or observing the patient.

OBJECTIVE (O) DATA

Vital signs, lab results, imaging results, EKGs, etc. are included in the objective data section. For our diabetic patient with the foot ulcer:

O: Diabetes mellitus x 15 years
Right foot lesion appears swollen, red, bone may be involved. No foul smell, slight discharge on compression.
Blood glucose = 175 mg/dL on admission
Temperature = 100°F on admission
Lungs: clear
Abdomen: soft, non-tender
Extremities: no edema; swollen right foot

The data included in the objective section are measurable and thus verifiable.

ASSESSMENT (A)

The clinician now reduces the data from the objective section (some of which may be problems) and assesses it while also taking into account the information recorded in the subjective section. At this point, the health care provider will make an assessment of the situation and write, for example:

A: 1) Diabetes mellitus
2) Right foot ulcer
3) Cellulitis vs Osteomyelitis

Performing the assessment, the caregiver determines whether the health problem is stable (diabetes mellitus, compliant with insulin regimen) or is unstable (right foot ulcer, cellulitis vs osteomyelitis).

In this section the pharmacist evaluates the patient's drug regimen using his or her knowledge and the eight MRPs as a foundation for the thought process. It is the assessment that supports the recommendation made in the **Plan**.

PLAN (P)

In the medical setting, the plan includes a suggested treatment, monitoring parameters, possible therapeutic end points, patient education,

recommendations and any additional diagnostic data that must be obtained. In our diabetic patient, for example, the plan may be as follows:

P:
1) Insulin, sliding scale
2) Culture foot wound
3) Antibiotics: vancomycin, gentamicin, peak and trough around third dose
4) Three phase bone scan
5) CBC, SMA-12, glycosylated hemoglobin (HbA_{1c})
6) Refer to certified diabetic educator (CDE) for patient education regarding diet and exercise

In recommending a Plan the caregiver determines if a problem is "stable" and care can continue as before or if additional data is necessary to support different treatment. In the example Plan, item 1 directly addresses the diabetes mellitus (but also implies the physician wants tighter control); items 2, 3, and 4 address the ulcer and cellulitis vs osteomyelitis. The additional laboratory studies ordered (item 5) will check for elevated white blood cells (infection), electrolyte balance (which can be affected by diet and disease), and verification that the underlying disease (diabetes mellitus) was/was not adequately controlled over the past few months (HbA_{1c}). Item 6 addresses the patient's noncompliance with diet and exercise therapy.

When providing pharmaceutical care, it is in this section where the pharmacist recommends drugs, dosages, schedules and monitoring parameters. Additional examples of case studies in SOAP format are available in the publication by Hart et al.[9]

CONTRIBUTING TO PATIENT CARE

Most physicians will accept or consider a pharmacist's input in the care of a patient if it is offered in a manner that indicates caring and makes a positive contribution to the overall care of the patient. It must be remembered though, that as a consultant, your recommendations will be either accepted, modified, or rejected.[13] In any case, it is the ***SOAP Note*** that is used as a vehicle to effect positive patient care outcomes.

CONSULTS UNRELATED TO DIAGNOSTIC IMAGING

The ***SOAP*** format is used as described or sometimes modified to suit a particular situation. Experience has shown that as caregivers become more specialized, the ***SOAP Note*** is modified in content and style to fit the particular situation. In our diabetic case example, a vascular surgeon who is consulted to advise on the vascular viability of the right foot will not go into the treatment of the diabetes mellitus but will only be concerned with his/her specialty area. Likewise, if the pharmacist does not participate in patient rounds, but instead monitors selected drugs, the "subjective" portion of the note can be deleted and patient specific information placed in the Objective section. For this reason, clinicians sometimes use an abbreviated ***SOAP Note*** to suit their particular situation.

The following is a review of some therapeutic drug consults to help one understand the process that is involved in effecting patient outcomes. It is important that the working relationship established with other professionals be one that is nurtured in professionalism and trust.

Patient A: 49 year old (y/o) black female with cancer of unknown primary. Status/Post (S/P) cholecystectomy. Two weeks later she presents with fever over 101°F and a suspected biliary tree infection. The Infectious Disease (ID) physician is consulted and antibiotics prescribed. About two weeks later, with no real change in her status, she is placed on imipenem/cilastatin (Primaxin®) 500 mg i.v. q6h. Her problem list includes multiple metastatic sites, decreased albumin and total protein, and persistent fever greater than 100°F. Her medications include morphine for pain and diphenhydramine to induce sleep.

The antibiotic regimen was discussed with the senior partner of the oncology group, along with the oncologist caring for the patient. The addition of a lipid-soluble antibiotic was suggested by the pharmacist in this situation. The attending oncologist requested that the pharmacist write a note to the ID physician.

Pharmacy Consult:

O: S/P cholecystectomy with temperature greater than 100°F. Increased serum

Now on Primaxin® 500 mg i.v. q6h.

A: With decreased liver function, imipenem/cilastatin will be primarily renally excreted. It may be more advantageous to try a third generation cephalosporin that is highly protein bound (e.g., ceftriaxone). This antibiotic is over 85% protein bound and at 1-2 h post infusion has greater bile concentration than in serum.[12] The bile concentration should remain high due to the morphine sulfate this patient is receiving.

P: Recommend adding ceftriaxone 1 Gm q24h for enterococcus coverage and maintain regimen of Primaxin® for continued pseudomonal coverage.

This patient was well known to the pharmacist, having undergone cisplatin-based chemotherapy for her adenocarcinoma of unknown origin. Although computed tomography (CT) images of the abdomen demonstrated resolution of her liver lesions, sequelae from her chemotherapy included anemia, electrolyte wasting, and proteinuria. Aggressive replacement of electrolytes and albumin resulted in only a minimal increase in this patient's laboratory values. Furthermore, her low complete blood count, secondary to chemotherapy, made the diagnosis of "infection" extremely difficult.

The choice of imipenem/cilastatin was certainly appropriate based on culture and sensitivity data, but based on pharmacodynamic/pharmacokinetic data, the pharmacist believed that this drug's normally short half- life, lack of protein binding and 70%-80% excretion in the urine as unchanged drug would not benefit the patient. On the other hand, ceftriaxone is 85%-90% protein bound, has a longer half-life and normally concentrates in the suspected site of infection. Both oncologists believed that the recommendation merited consideration, but the ID physician rejected the consult. After almost four weeks of antibiotic therapy, with no real improvement in the patient's temperature and continued low WBC, secondary to chemotherapy, all antibiotic therapy was stopped. The patient was discharged to home care with the discharge diagnosis noting an elevated temperature as "tumor fever." This illustrates the fact that your recommendations are not always followed.[13] This case was categorized as MRP#2, i.e., improper drug selection.

Patient B: 84 y/o white male with persistent urinary tract infection (UTI) with urine culture positive for *Pseudomonas aeruginosa* as an outpatient that was resistant to ciprofloxacin. The patient was admitted for i.v. antibiotics (ABX).

Pharmacokinetics Consult:

O: Patient with UTI resistant to ciprofloxacin as outpatient. On gentamicin 100 mg q12h and ceftazidime 1 Gm q8h. Blood levels on this gentamicin dosage are peak = 10.2 mg/L and trough = 6.0 mg/L (↑).

A: These gentamicin levels indicate a half life of 14 hours and a volume of distribution (V_d) of 17L. The patient's creatinine clearance is calculated to be 31 mL/min. Half life is appropriate for patient's age and renal function while V_d indicates patient is "dry" (dehydrated) which is verified by fluid input/output (I/O) records.

With a half life of 14h, it is necessary to wait about 24h to get a trough level less than 2 mg/L and preferably less than 1.5 mg/L. Tomorrow morning at 0800 trough calculates 1.5 mg/L.

P: Consider random trough level tomorrow around 0800. If level is appropriate and more gentamicin is required, then 80 mg q24h is estimated to yield a peak = 5.0 mg/L and trough = 1.6 mg/L. If patient remains dry and/or serum creatinine remains at 1.7 mg/dL or increases, one may want to consider (1) discontinuing gentamicin or (2) extending dosing interval to q36h. Consider changing ceftazidime schedule to q24h secondary to a decrease in creatinine clearance.

Discussion: The consult was met with "mixed" acceptance. The ceftazidime schedule was changed as recommended. The gentamicin dose was increased above that recommended, but the schedule was accepted. By the time the next gentamicin peak and trough levels were obtained, the patient was better hydrated, but the serum levels were still high. This necessitated another "Pharmacokinetics Consult," along with a personal discussion with the physician assistant caring for the patient. This case was categorized as MRP #5, i.e., overdosage.

Patient C:

O: Patient with aspiration pneumonia. On gentamicin 100 mg q12h and ceftazidime 1 Gm q8h. Gentamicin levels are peak = 5.2 mg/mL and trough = 1.6 mg/mL. Serum creatinine is now 1.1 mg/dL and trending down. WBC = 11,200/mm^3 and trending up while temperature is still increased. Blood culture results show: mixed aerobic and anaerobic gram positive cocci.

A: Gentamicin blood levels indicate a half life of 5.8 hours and a V_d of 22.5 L. The half life is acceptable for a patient with a creatinine clearance of 40 mL/min. V_d is greater than population average but is consistent with i.v. fluid intake.

P: Recommend: (1) gentamicin 200 mg q24h to get increased peak levels for pneumonia. This dosage regimen should result in a peak = 8.9 mg/mL and trough = 0.7 mg/mL. (2) Add clindamycin 600 mg q6h for anaerobe coverage.

Discussion: In this case, the patient had been on gentamicin and ceftazidime for over 48 hours without a significant change. The patient's serum creatinine was trending down and was most likely secondary to the i.v. fluid therapy. On the other hand, the temperature was still elevated and the patient's WBC was increasing, suggesting the antibiotics were not "covering" the infectious agent. As noted in the physician's progress notes: "aspiration pneumonia" was #1 in the list of patient's problems, but anaerobic bacteria are not covered by gentamicin and ceftazidime. Both recommendations were accepted. This case was categorized as MRP #3, i.e., subtherapeutic dosage and MRP #1, i.e., untreated indication.

PHARMACEUTICAL CARE AND DIAGNOSTIC IMAGING

The following six cases illustrate how pharmaceutical care principles were, or might have been, applied to help patients scheduled for diagnostic imaging procedures.

Case 1: An elderly diabetic with lower extremity complications is scheduled for a nuclear medicine bone scan to aid in the diagnosis of osteomyelitis. The patient is injected with the radiopharmaceutical and the three phase bone scan begun. It is then realized that the foot has already been amputated!

Discussion: An appropriate patient interview or a review of patient specific information by the nuclear pharmacist would have revealed that the original indication for the bone scan was no longer valid. This case is an example of Medication Related Problem #8, i.e., drug use without indication. The MRPs as originally described by Hepler and Strand address problems associated with therapeutic pharmaceuticals, but this case is an example of how a simple "drug use review" by the pharmacist would have avoided this diagnostic MRP.

Case 2: A 51 y/o white male is admitted with a chief complaint of feeling "run down" in the past few days. Temperature was 101°F at home. The working diagnosis is pyelonephritis secondary to a defective urinary drainage device (broken, occluded stent). Other problems include diabetes with questionable cellulitis, osteomyelitis of left lower extremity and arthritis. He is started on vancomycin, ceftazidime, and gentamicin. After about 1 week, a ^{67}Ga-citrate scan is ordered to rule out infected kidney. The choice of radiopharmaceutical was discussed with the ID physician after the pharmacist wrote the following note:

O: Patient with pyelonephritis most likely secondary to occluded stent. ^{67}Ga-citrate scan ordered to "rule out infected kidney."

A: Ga-citrate study will take 48-72 hours to complete after patient is pretreated with laxative.

P: Recommend ^{99m}Tc or ^{111}In leukocytes as alternative diagnostic radiopharmaceutical as useful information can be obtained in $\leq$ 24 hours.

According to information in the patient's chart, the present condition, pyelonephritis and non-functioning stent, were acute events. Thus, ^{99m}Tc or ^{111}In leukocytes could have been prescribed and diagnostic information obtained the same day or within a 24 hour period.[14] After three days of imaging with ^{67}Ga-citrate the radiology report stated,

"consistent with nephritis." Although the most common cause of acute interstitial nephritis is drug related (antibiotics, diuretics, NSAIDs), the patient's drug history did not support this etiology. The most likely cause was the non-functioning stent.[15] This case was categorized as MRP #2, i.e., improper drug selection.

Case 3: A 57 y/o white female is admitted with a diagnosis of congestive heart failure (CHF) and pulmonary edema. Her problem list includes lung cancer (non oat cell) with lymphatic spread, skin metastases and pulmonary hypertension. Her past medical history includes S/P radiation therapy x 33 doses, S/P lobectomy, and completion of chemotherapy about one month ago. The physician progress notes indicate that a strained right ventricle is resulting in the pulmonary hypertension. Although the patient does not present with the "textbook" signs of pulmonary emboli (PE), such as tachypnea, chest pain and dyspnea, the oncologist wanted to rule out PE.[16] Therefore, he ordered a nuclear medicine ventilation/perfusion (V/Q) lung scan.

Discussion: The oncologist was contacted after the pharmacist notified the nuclear medicine staff that this patient may present a problem. Aggregated albumin is contraindicated in severe pulmonary hypertension.[17] Although this patient was not classified as having "severe" pulmonary hypertension, this patient was unique in that she was S/P lobectomy and radiation therapy to the lung field. This patient had fewer pulmonary capillaries and the pharmacist reasoned that the therapeutic radiation may also have caused radiation fibrosis in the contralateral lung and possibly be a contributor to the right ventricle strain.[18] Based on the pharmacist's recommendation, the oncologist canceled the V/Q lung scan and discharged the patient to a hospice. This case is an example of MRP #2, i.e., improper drug selection, and the pharmacist's intervention prevented MRP #5, i.e., overdose (potential for too many aggregated albumin particles) and MRP #6, i.e., adverse drug reaction (potential fatality).

Case 4: A 57 y/o black male presents with a chief complaint of shortness of breath. Past medical history includes CHF, cardiomyopathy, hypertensive cardiovascular disease and pulmonary hypertension. Past surgical history includes placement of a pace maker. His medications prior to admission include: furosemide 40 mg qd, digoxin 0.125 mg qd, amlodipine 10 mg qd, warfarin 10 mg qd, lisinopril 20 mg qd, KCl 20 mEq qd and amiodarone 200 mg qd.

Two days prior to admission, the patient developed dyspnea on exertion, night sweats and nocturnal dyspnea. The patient denies chest pain or non-compliance with his medications.

Physical exam reveals a moderately enlarged thyroid. Thyroid laboratory studies ($\uparrow T_4$, $\uparrow T_3$ and $\downarrow$TSH) suggest a recent onset of hyperthyroidism possibly induced by the antiarrhythmic amiodarone.

Discussion: Amiodarone is a class III antiarrhythmic available as 200 mg tablets and contains 37.2% iodine by weight with approximately 6 mg/day of iodine released for each 200 mg ingested.[19] Although most patients on this drug remain euthyroid, thyrotoxicosis (2-3%) or hypothyroidism may develop. In this case, the patient's complaints, physical exam and thyroid lab studies suggest the thyrotoxic state. On review of his medication list, amiodarone was the only iodine-containing product. The drug or the iodine released has a direct effect on the thyroid cell causing acute thyroiditis and a resultant release of thyroid hormones.[20,21] Amiodarone can interfere with thyroid function tests by inhibiting the peripheral conversion of thyroxine (T_4) to tri-iodothyronine (T_3). Serum T_4 and reverse T_3 may be increased while serum T_3 may be decreased. In this patient, both T_4 and T_3 were increased and thyroid stimulating hormone (TSH) decreased, all suggestive of hyperthyroidism.

This is a typical case of a patient on an iodine-containing drug in which the standard nuclear medicine uptake and scan would be contraindicated. However, the nuclear medicine procedure was selected to confirm the diagnosis of amiodarone-induced thyrotoxicosis. The results of the ^{123}I sodium iodide uptake and scan yielded a 1% uptake and non-visualization of the thyroid bed, both consistent with exogenous iodide induced thyroiditis and thyrotoxicosis.

This is an example of MRP #6, i.e., adverse drug reaction, that was confirmed by the thyroid uptake and scan.

Case 5: A 57 y/o white male presents to his family physician with symptoms of diabetes, anemia, weight loss and a skin rash on his extremities and lower body. His past medical and surgical history include a primary tumor of the pancreas surgically excised about 3.5 years ago. His current symptoms mimic those from his original diagnosis.

Neuroendocrine tumors, especially those of islet-cell origin, are slow growing and 15 year survival rates are typical in these patients. The average age of onset is 50 years. Patients with tumors that secrete glucagon, which in turn, stimulates gluconeogenesis by the liver, most often present with the classical signs of diabetes mellitus. Frequently, weight loss, normochromic anemia, hypoaminoacidemia and hypolipidemia are present, but the most distinctive clinical feature in this patient was the necrolytic migratory erythema (described by this patient as a "rash").

Treatment is by surgical excision of the tumor(s), but if the tumor is non-resectable or there are metastatic lesions, a combination of streptozocin and 5-fluorouracil are used. Octreotide acetate (Sandostatin®) can be used to suppress glucagon production with a concomitant improvement of the diabetes and rash.

The diagnosis of a glucagonoma was initially made based on the patient's elevated serum immunoreactive glucagon. The oncologist wanted confirmation plus evaluation of disease extension and thus ordered an ^{111}In pentetreotide scan (Octreoscan®). Imaging results confirmed the initial diagnosis with a solitary lesion at the tail of the pancreas and at least three metastatic sites in the liver.

This case presents a challenge for the pharmacist because many of these patients may be treated with octreotide acetate (Sandostatin®) prior to the diagnostic imaging procedure. The current package insert does mention a potential drug interaction between the therapeutic agent and the diagnostic agent, but no detailed recommendations are provided.[22] The half life of octreotide acetate is 60-110 minutes with a duration of action as long as 6-12 hours.[23]

If pharmacokinetic knowledge is applied, the pharmacist would be inclined to recommend the therapeutic agent be held for about ten half lives in order that sufficient receptor sites are available for localization. But does the pharmacist use the half life or the duration of action as the basis for the calculations? The pharmacist can be conservative and recommend the therapeutic agent be held for 10-18 hours, or one day to be practical, or as long as 120 hours or five days! Treatment with octreotide acetate would be a viable option in this patient because he presented with the classical signs of diabetes mellitus. The most conservative recommendation should be offered in this case so that the management of the diabetes would not be overly compromised.

Depending on what recommendation is made by the pharmacist this case can be categorized as MRP #7, i.e., drug interaction, if the Sandostatin® is not held and it is later determined that a suboptimal study was the result. If the recommendation is made to hold the Sandostatin® for five days then this would most likely be categorized as a MRP #1, i.e., untreated indication (unless the diabetes can be successfully treated via aggressive insulin therapy).

Case 6: A 50 y/o male is diagnosed with adenocarcinoma of the prostate with metastatic spread to the lungs and bone. His past medical history is insignificant except that his cancer was initially treated with thoracolumbar spinal irradiation for cord compression followed by one cycle of chemotherapy with doxorubicin hydrochloride. His disease continued to spread and the chemotherapy was changed to 5-fluorouracil and etoposide. His bone pain was initially managed with naproxen 500 mg po TID. Within days, morphine sulfate 30 mg po TID was added. About one month later his pain regimen was: meperidine 25 mg i.m. q4-6h prn pain, promethazine 25 mg with each meperidine dose, morphine sulfate 60 mg po TID, and naproxen 375 mg po TID.

Six months later the patient is admitted to the hospital complaining of progressive pain. MRI demonstrated spinal cord involvement and he was treated with high dose carboplatin and dexamethasone. The patient was discharged on the following pain regimen: hydromorphone 3 mg i.v. push every 3 hours for pain, fentanyl patch 50 mcg/hr every 72 hours, oxycodone/acetaminophen 2 tablets q4h prn, ketorolac 10 mg po TID.

Two months later the patient is admitted for evaluation of his pain regimen and a distended abdomen secondary to obstipation caused by the narcotic analgesics.

Discussion: The patient's disease was so advanced that the pain management technique employed was

only partially successful and was causing severe adverse effects (obstipation), even though the concurrent use of laxatives and stool softeners appeared appropriate. The pharmacist suggested ^{89}Sr chloride as an adjunct to this patient's pain management regimen. The patient succumbed to his disease before the therapeutic radiopharmaceutical could be administered.

This case is an example of multiple MRPs: MRP #2 (improper drug selection) -- ^{89}Sr chloride should have been considered sooner; MRP #5 and #6 (overdose, adverse drug reaction) - although it is an accepted standard of care to administer as much analgesics as required for the treatment of cancer pain, the exacerbation of narcotic-induced constipation (obstipation) made it clear that another pharmacologic approach should be considered.

These six cases illustrate the type of pharmaceutical care that can be performed for patients scheduled for diagnostic imaging studies. Figure 1 is a form titled Pharmaceutical Care Plan (PCP), that pharmacy practice faculty and students use in their patient care activity at Mercer University. Figure 2 is a modified Pharmaceutical Care Plan that is utilized in the care of patients scheduled for diagnostic imaging procedures. Many times during the drug review and patient interview, the pharmacist will determine that there are no MRPs but the patient needs follow up labs or needs to be referred to another health care professional. In this situation, MRP #9 is checked on our form. Many patients have their disease(s) well controlled and only require a routine follow up. In this situation, MRP #10 is indicated on our form.

REIMBURSEMENT FOR COGNITIVE SERVICES

Significant literature has been published to assist the pharmacist in establishing pharmaceutical care and receiving reimbursement for such services.[24-30] It is also noteworthy that pharmacists in other countries are receiving payment for cognitive services.[28,29]

The most difficult aspect of providing pharmaceutical care is simply getting started. Eight steps have been outlined by Perri [25] to facilitate payment for patient care services that are completely applicable to nuclear pharmacists in the community or hospital setting.

Perri's eight steps with suggested action plans are as follows:

1. **Get Involved.**
Pharmacists need to get more clinically involved with the use of the drug products they dispense. Join your professional societies and lobby for initiatives that support pharmacist reimbursement. It is necessary for pharmacists to educate insurance companies and benefit plan managers of the value of pharmacist interventions.

2. **Develop a plan.**
Concentrate on a specific patient type, and/or imaging procedure, as outlined in Tables 2 and 3, to begin your pharmaceutical care efforts. Appropriate patient medication reviews are essential for all the nuclear medicine procedures that include pharmacologic intervention.[31] Some typical examples are:

a. Hypercalcemia of Malignancy
Hypercalcemia occurs commonly in patients with cancer and contributes significantly to their morbidity and mortality. Lung, breast and hematologic cancers are most commonly associated with this phenomena. Treatment of hypercalcemia is multifactorial including hydration, bisphosphonates, calcitonin, corticosteroids, glucocorticoids, plicamycin, oral phosphates and gallium nitrate. Many of these cancer patients are scheduled for bone scans to evaluate the extent of their disease. Both etidronate disodium (Didronel®) and pamidronate disodium (Aredia®) have exceptionally long "bone" half lives and it is not practical to expect the patient to be off this therapy for more than a week before the bone scan. Health care providers should be informed the patient is taking either of these drugs and a suboptimal bone scan might be possible.

a. Cardiac stress studies
Adenosine (Adenocard®) and dipyridamole (Persantine®) are two

FIGURE 1

PHARMACEUTICAL CARE PLAN

Patient Identifier

Vital Statistics and History

Age_____ **Race**_____ **Sex**_____ **Ht**_____ **Actual Wt**_____ **IBW**_____ **Adj. BW**_____ **ClCr**_____ **BP** _____ **HR** _____ **R** _____ **Temp**_____

CC_____ **Date of Admission**_____ **Allergies**_____

HPI_____

PMH_____

Drug History PTA (i.e. Rx: scheduled, prn; OTC; ETOH; Tob; Drugs)	**Active Problem List Supporting Labs**
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.

Date Start	Date D/C	Drug/Dose/Interval	Desired Outcome	Monitoring Parameters/Precautions	Therapeutic Outcome Achieved	A	B

A Medication Related Problems: 1. Untreated Indication 2. Improper drug selection 3. Subtherapeutics dosage 4. Failure to receive drug 5. Overdosage (toxic) 6. Adverse Drug Reactions/SE 7. Drug Int./Drug-Food Int. 8. Drug use without indication 9. Other (explain) 10. None Identified

B Recommendations: 1 = Followed 2 = Partially Followed 3 = Not Followed 4 = Information Only 5 = None

FIGURE 2

PHARMACEUTICAL CARE FOR DIAGNOSTIC IMAGING

Study Requested:_____ Radiopharmaceutical:_____ Dose:_____mCi

Adjuvant Pharmaceuticals Required: _____ Dose: _____

Vital Statistics and History: Age_____ Race_____ Sex_____ Ht_____ Wt_____ ClCr_____

Date of Admission_____

CC_____

PMH _____

HPI _____

Admission Drug History _____

Previous Diagnostic Imaging/Results: _____

Problem List _____

Other Pertinent Diagnostic/Lab Data:

Labs:_____

Biopsy:_____

EKG:_____

Other:_____

Date Start	Date D/C	Drug/Dose/Interval	Indication	Monitoring Parameters/ Precautions	MRP Category*	Recommendation**	Outcome Achieved

*Medication Related Problems:

1. Untreated Indication
2. Improper drug selection
3. Subtherapeutics dosage
4. Failure to receive drug
5. Overdosage (toxic)
6. Adverse Drug Reaction/SE
7. Drug Int./Drug-Food Int.
8. Drug use without indication
9. Other (explain)
10. None identified

**Recommendations:

1=Followed
2=Partially Followed
3=Not Followed
4=Information Only
5=None

Pharmacy Notes:_____

potent coronary vasodilators used as adjuncts in myocardial imaging. Often times, these procedures are performed in the morning. Appropriate patient counseling needs to be performed by the pharmacist so the patient is informed that beverages such as coffee, tea and many soft drinks will interfere with the outcome of the study. Patients prescribed theophylline or those using common OTC analgesics containing caffeine also need to be informed about the possible interference and should be offered alternative medication or dosing schedules.[32]

3. **Get more information.**
A practical problem faced by all pharmacists attempting to offer pharmaceutical care services is the availability of relevant clinical information. This situation is particularly critical of those practicing in CNPs. It will be necessary to establish a professional rapport with client institutions. Start small - select one client institution and begin a mini-externship in nuclear medicine. Interview the outpatients, take a medication history and review the patients' chart and medication administration record (MAR) for inpatients. Participate in the film reading sessions with the radiologist /nuclear medicine physician and as you become comfortable with the nuclear medicine staff you can begin to offer professional advice. If there are pharmacist clinicians at the institution begin making rounds with them as a means of developing a professional rapport. Educate them on the MRPs as they relate to nuclear medicine procedures.

4. **Choose a starting point.**
Ask to be consulted in select cases, such as outpatient cardiac stress patients or bone scans in oncology patients and request that the pharmacist clinicians support you with objective data from the patient's medical record. If you offer services to a client institution which is covered by an annual contract, include pharmaceutical care services in the contract. When a positive contribution is made and accepted, file a claim with the patient's insurance company or benefit plan manager.

5. **Provide documentation of service.**
Document all your interventions -- those that are accepted and those that are rejected. Use the PCP forms included with this article. Your documentation is vital in supporting your claim for payment of cognitive services.

6. **Identify potential payers.**
Check with the clinician pharmacists in your community who are being reimbursed for cognitive services; what did they do to get paid? Do the same thing! Find out from plan benefit managers and insurance companies in your state what you need to have in place in order to be reimbursed.

Some states or insurance companies may require the pharmacist have a provider number while others will accept a letter from the patient's physician authorizing the pharmacist to review the patient's drug therapy and other medical record information ("medical necessity"). Whatever system is being utilized by the pharmacists in your community is the one to adopt. The article by Constantine and Scott [24] is particularly helpful in describing the strategies used by pharmacists who are being reimbursed for cognitive services.

7. **Establish professional fees.**
This is one of the most difficult aspects of reimbursement that pharmacists face once they begin offering cognitive services. First check what is happening in your community. How much are community pharmacists, hospital pharmacists and nursing home consultant pharmacists charging? Check with your state and national professional societies to see what the current social or political trends are. Physicians and other health care professionals have been charging for "non-product" services for such a long time it is second nature to them. If you start small, as suggested, you can determine a reasonable fee that can be adapted to other situations as you expand your pharmaceutical care services.

8. **Submit claims for service.**
Once these steps are initiated, the pharmacist must submit a claim form to the patient's

insurance company for reimbursement. It is mandatory that the pharmacist complete these forms accurately to facilitate payment. Two forms are available, the "Pharmacist Care Claim Form" (PCCF), from the National Community Pharmacists Association (NCPA) [available from Med-Pass, P.O. Box 367, Dayton, OH 45459, (800)438-8884, FAX (513) 438-8361] (Figure 3) and the universal claim form used for Medicare and Medicaid patients, "Health Insurance Claim Form", Form HCFA-1500, (800) 477-7374 (Figure 4). Both forms have been used successfully by pharmacists seeking reimbursement for cognitive services. These forms contain all the vital information that must be completed for successful reimbursement. As with all forms, there are "tricks," and one is advised to discuss the proper completion of the forms with local insurance companies or practitioners prior to submission. Two references are available that will explain the proper procedures, Common Procedural Terminology (CPT) codes, and other information necessary to submit a successful claim.[33,34] These references are essential because it is easier to complete a claim form correctly prior to submission, than to correct one once it has been submitted and rejected.

Figure 5 is a completed "Pharmaceutical Care for Diagnostic Imaging" form for patient Case 3. Note that the requested V/Q Scan is listed in the column "Drug/Dose/Schedule" and categorized as MRP #2 and 6, *Improper Drug Selection* and *Adverse Drug Reaction*. On the bottom of the form, in the Pharmacy Notes section, the action taken on behalf of the patient is documented. Note that the recommendation was categorized as being followed and the outcome achieved. The form illustrated in Figure 2 can be faxed or e-mailed to client institutions and completed by the nuclear medicine technologist or the pharmacist at the institution performing patient care services.

Figure 6 illustrates how the Pharmacist Claim Form is completed for the patient in Case 3. Under Column I, "Reason for Services," the last entry (*Other*) is checked for the package insert contraindication of perfusion imaging and pulmonary hypertension. Although fewer aggregated albumin particles might have been suggested in this case, it is of particular concern that the patient had a lobectomy and 33 courses of radiation therapy. Thus, with only one lung and probably some pulmonary scaring secondary to the radiation therapy, it is virtually impossible to determine the safe number of particles to use.

In Column II under Professional Services, Patient Care, *Prescriber Consulted* is checked because the oncologist was contacted. The "Recommendations" in Column III included canceling the V/Q scan along with not dispensing the radiopharmaceuticals.

Column IV documents the "Results of Services" and notes that the prescription was not filled, the recommendation was accepted and the patient was discharged to hospice care. This consult potentially prevented a fatal drug event, therefore it was classified as Level 5 (highest) in Column V, "Level of Services." Rupp discusses the five levels of care and Level 5 included the following components:[26]

1. The service provided was comprehensive.
2. The service involves extensive diagnosis or treatment options, exceptional amount of complexity of data considered and very high risk.
3. Counseling or coordination of care dominates the service and it required more than one hour of the pharmacist's time.

The consult is written in SOAP format in the "Discussion" section of the form to support the reimbursement claim.

CONCLUSION

Academic and community nuclear pharmacists can become more clinically involved by becoming proactive and preventing medication-related problems that may interfere with diagnostic imaging procedures.

The examples illustrated in this paper give the pharmacist a proven method to communicate with physicians, effect change and seek reimbursement.

FIGURE 3

PHARMACIST CARE CLAIM FORM

FORM # [illegible] Reorder from [illegible]

Subscriber Information

Name | Phone

Address

City | State | Zip

Birthdate | Sex M F | Social Security/Subscriber I.D. No. | Date of Service

Employer | Employer I.D.

Group No. | Plan No.

SUBMIT TO ▶

REFERENCE NUMBER

Patient

Name | Birthdate | Sex M F

Relationship of Patient to Subscriber ☐ Self ☐ Spouse ☐ Child ☐ Other

Full-Time Student ☐ Yes ☐ No If Yes, Where?

CERTIFICATION STATEMENT

I certify that the patient information entered on this form is correct, the patient named is eligible for the benefits, and the patient has received the pharmacist care/services rendered. I authorize release of information in this record to health care providers, institutions, and/or payers as may be necessary to facilitate care and/or process payment for pharmacist care rendered.

Signature | Date

Pharmacist Care Information

I. PROBLEMS AND NEEDS*

Drug Product Selection

01 ☐ Drug Needed But Not Prescribed
02 ☐ Prescribed Drug Not Needed
03 ☐ Duplication
04 ☐ Ease-of-Use
05 ☐ Efficacy
06 ☐ Safety
07 ☐ Cost

Regimen

08 ☐ Dose
09 ☐ Schedule/Duration
10 ☐ Route
11 ☐ Dosage Form

Contraindication/Interaction

12 ☐ Age
13 ☐ Disease or Condition
14 ☐ Drug
15 ☐ Food
16 ☐ Laboratory
17 ☐ Pregnancy/Nursing

Adverse Effect

18 ☐ Additive Effects
19 ☐ Allergy
20 ☐ Toxicity

Request for Information

21 ☐ Patient
22 ☐ Patient's Caregiver
23 ☐ Health Care Provider
24 ☐ Third-Party Payer

Patient Product Misuse

25 ☐ Underuse
26 ☐ Overuse
27 ☐ Abuse
28 ☐ Not Filled or Refilled
29 ☐ Stored Inappropriately

30 ☐ Prescription Clarification
96 ☐ Other (Specify)

*Actual, suspected, or potential drug and health-related problems and needs.

II. ACTIONS AND INTERVENTIONS

40 ☐ Contact Health Care Provider
41 ☐ Contact Third-Party Payer
42 ☐ Counsel Patient
43 ☐ Counsel Patient's Caregiver
44 ☐ Demonstration
45 ☐ Develop Compliance Aid
46 ☐ Education
47 ☐ Monitor Drug Therapy
48 ☐ Refer
49 ☐ Consult on Self-Care
97 ☐ Other (Specify)

III. RECOMMENDATIONS

60 ☐ Add Drug
61 ☐ Discontinue Drug
62 ☐ Do Not Dispense Drug
63 ☐ Change Drug
64 ☐ Change Dose
65 ☐ Change Dosage Form
66 ☐ Change Route
67 ☐ Change Schedule/Duration
68 ☐ Referral
69 ☐ Self-Care
70 ☐ Continue Without Change
98 ☐ Other (Specify)

IV. RESULTS OR OUTCOMES

80 ☐ Drug Added
81 ☐ Drug Discontinued
82 ☐ Drug Not Dispensed
83 ☐ Drug Changed
84 ☐ Dose Changed
85 ☐ Dosage Form Changed
86 ☐ Route Changed
87 ☐ Schedule/Duration Changed
88 ☐ Patient Accepted Referral
89 ☐ Patient Accepted Self-Care
90 ☐ Recommendation NOT Accepted
99 ☐ Other (Specify)

V. DISCUSSION AND SPECIFIC DRUGS INVOLVED

VI. PROFESSIONAL FEES

Code	Fee	Code	Fee
Code	Fee	TOTAL FEE	

Pharmacy Imprint

NAME

ADDRESS

PHONE

NABP NO. | SSN/TIN

I hereby certify that the pharmacist care rendered as indicated has been completed and the fees submitted are the actual fees I have charged and intend to collect for those services.

Signature of Pharmacist ▶

Date | License No.

© 1993 NARD WHITE - PAYER YELLOW - PATIENT PINK - PHARMACY/OTHER

PLEASE DO NOT STAPLE IN THIS AREA

FIGURE 4

PICA

HEALTH INSURANCE CLAIM FORM

PICA

CARRIER

PATIENT AND INSURED INFORMATION

1. MEDICARE (Medicare #) | MEDICAID (Medicaid #) | CHAMPUS (Sponsor's SSN) | CHAMPVA (VA File #) | GROUP HEALTH PLAN (SSN or ID) | FECA BLK LUNG (SSN) | OTHER (ID)

1a. INSURED'S I.D. NUMBER (FOR PROGRAM IN ITEM 1)

2. PATIENT'S NAME (Last Name, First Name, Middle Initial)

3. PATIENT'S BIRTH DATE MM | DD | YY SEX M F

4. INSURED'S NAME (Last Name, First Name, Middle Initial)

5. PATIENT'S ADDRESS (No., Street)

6. PATIENT RELATIONSHIP TO INSURED Self | Spouse | Child | Other

7. INSURED'S ADDRESS (No., Street)

CITY | STATE

8. PATIENT STATUS Single | Married | Other; Employed | Full-Time Student | Part-Time Student

CITY | STATE

ZIP CODE | TELEPHONE (Include Area Code)

ZIP CODE | TELEPHONE (INCLUDE AREA CODE)

9. OTHER INSURED'S NAME (Last Name, First Name, Middle Initial)

10. IS PATIENT'S CONDITION RELATED TO:

11. INSURED'S POLICY GROUP OR FECA NUMBER

a. OTHER INSURED'S POLICY OR GROUP NUMBER

a. EMPLOYMENT? (CURRENT OR PREVIOUS) YES NO

a. INSURED'S DATE OF BIRTH MM | DD | YY SEX M F

b. OTHER INSURED'S DATE OF BIRTH MM | DD | YY SEX M F

b. AUTO ACCIDENT? YES NO PLACE (State)

b. EMPLOYER'S NAME OR SCHOOL NAME

c. EMPLOYER'S NAME OR SCHOOL NAME

c. OTHER ACCIDENT? YES NO

c. INSURANCE PLAN NAME OR PROGRAM NAME

d. INSURANCE PLAN NAME OR PROGRAM NAME

10d. RESERVED FOR LOCAL USE

d. IS THERE ANOTHER HEALTH BENEFIT PLAN? YES NO *If yes,* return to and complete item 9 a-d.

READ BACK OF FORM BEFORE COMPLETING & SIGNING THIS FORM.

12. PATIENT'S OR AUTHORIZED PERSON'S SIGNATURE I authorize the release of any medical or other information necessary to process this claim. I also request payment of government benefits either to myself or to the party who accepts assignment below.

SIGNED _____ DATE _____

13. INSURED'S OR AUTHORIZED PERSON'S SIGNATURE I authorize payment of medical benefits to the undersigned physician or supplier for services described below.

SIGNED _____

PHYSICIAN OR SUPPLIER INFORMATION

14. DATE OF CURRENT: MM | DD | YY — ILLNESS (First symptom) OR INJURY (Accident) OR PREGNANCY (LMP)

15. IF PATIENT HAS HAD SAME OR SIMILAR ILLNESS, GIVE FIRST DATE MM | DD | YY

16. DATES PATIENT UNABLE TO WORK IN CURRENT OCCUPATION MM | DD | YY FROM TO

17. NAME OF REFERRING PHYSICIAN OR OTHER SOURCE

17a. I.D. NUMBER OF REFERRING PHYSICIAN

18. HOSPITALIZATION DATES RELATED TO CURRENT SERVICES MM | DD | YY FROM TO

19. RESERVED FOR LOCAL USE

20. OUTSIDE LAB? YES NO $ CHARGES

21. DIAGNOSIS OR NATURE OF ILLNESS OR INJURY. (RELATE ITEMS 1,2,3 OR 4 TO ITEM 24E BY LINE)

1. ____ 3. ____

2. ____ 4. ____

22. MEDICAID RESUBMISSION CODE ORIGINAL REF. NO.

23. PRIOR AUTHORIZATION NUMBER

24. A DATE(S) OF SERVICE From MM DD YY To MM DD YY	B Place of Service	C Type of Service	D PROCEDURES, SERVICES, OR SUPPLIES (Explain Unusual Circumstances) CPT/HCPCS	MODIFIER	E DIAGNOSIS CODE	F $ CHARGES	G DAYS OR UNITS	H EPSDT Family Plan	I EMG	J COB	K RESERVED FOR LOCAL USE
1											
2											
3											
4											
5											
6											

25. FEDERAL TAX I.D. NUMBER SSN EIN

26. PATIENT'S ACCOUNT NO.

27. ACCEPT ASSIGNMENT? (For govt. claims, see back) YES NO

28. TOTAL CHARGE $

29. AMOUNT PAID $

30. BALANCE DUE $

31. SIGNATURE OF PHYSICIAN OR SUPPLIER INCLUDING DEGREES OR CREDENTIALS (I certify that the statements on the reverse apply to this bill and are made a part thereof.)

SIGNED DATE

32. NAME AND ADDRESS OF FACILITY WHERE SERVICES WERE RENDERED (If other than home or office)

33. PHYSICIAN'S, SUPPLIER'S BILLING NAME, ADDRESS, ZIP CODE & PHONE #

PIN# GRP#

(APPROVED BY AMA COUNCIL ON MEDICAL SERVICE 8/88)

PLEASE PRINT OR TYPE

FORM HCFA-1500 (12-90)
FORM OWCP-1500 FORM RRB-1500

C1502

inHealth Record Systems (div. of Professional Filing Systems, Inc.)
To Order Call 1-800-477-7374, In Atlanta 770/396-4994

APPROVED OMB-0938-0008

FIGURE 5

PHARMACEUTICAL CARE FOR DIAGNOSTIC IMAGING

Study Requested: V/Q Scan Radiopharmaceutical: 99mTcMAA/133 Xe gas Dose: 5.0/15 mCi

Adjuvant Pharmaceuticals Required: N/A Dose: N/A

Vital Statistics and History: Age 57 Race W Sex F Ht 5'4" Wt 57Kg ClCr 57ml/min

Date of Admission 3-22

CC Shortness of Breath

PMH CA Lung, S/P Lobectomy and XRT: 33 doses; hepatitis

HPI CHF, Pulm Edema, Hypotension, COPD

Admission Drug History: Cough meds; Pain meds; Chemo as O.P.

Previous Diagnostic Imaging/Results:

Problem List: CA Lung, multiple met sites, COPD, Pulm HTN

Other Pertinent Diagnostic/Lab Data:

Labs: H and H, RBC; Platelets 50

Biopsy:

EKG:

Other: tachycardia secondary to Rt ventricle strain

Date Start	Date D/C	Drug/Dose/Interval	Indication	Monitoring Parameters/ Precautions	MRP Category*	Recommendation**	Outcome Achieved
3-23	3-30	Cefuroxime 1.5Gm q8h		CXR, WBC, Temp			
			Pneumonia	Lung sounds	10		
3-24	4-23	Entex LA bid	COPD	Lung sounds	10		
3-30	4-9	Ceftin 500mg bid	Pneumonia	as in Cefuroxime	10		
4-1	4-6	Duflucan 100mg QD	Prophylaxis		10		
4-3	5-3	Lasix 40mg QD	CHF, COPD	Fluid output, lung sounds			
3-30		V/Q Scan	R/O PE source		2,6	1: cancel study	yes
			of Pulm HTN			see comments	

*Medication Related Problems:
1. Untreated Indication
2. Improper drug selection
3. Subtherapeutics dosage
4. Failure to receive drug
5. Overdosage (toxic)
6. Adverse Drug Reaction/SE
7. Drug Int./Drug-Food Int.
8. Drug use without indication
9. Other (explain)
10. None identified

**Recommendations:
1=Followed
2=Partially Followed
3=Not Followed
4=Information Only
5=None

Pharmacy Notes: Called Oncologist; contraindication of Perfusion Scan in pt with Pulmonary Hypertension, s/p Lobectomy and XRT. MD agreed to cancel study and discharge patient to hospice.

FIGURE 6

PHARMACIST CARE CLAIM FORM

FORM # ND1203
REORDER FROM: 1-800-338-3884

Patient Information

Name | Telephone

Address

City | State | Zip

Birthdate | Sex M F | Social Security/Subscriber I. D. No. | Date of Service

Subscriber Information

Employer | Employer I. D.

Group No. | Plan No.

Patient Information

Name | Birthdate | Sex M F

Relationship of Patient to Subscriber ☐ Self ☐ Spouse ☐ Child ☐ Other

Full-Time Student ☐ Yes ☐ No If Yes, Where?

SUBMIT TO ▶

REFERENCE NUMBER

PATIENT AUTHORIZATION

I hereby authorize release of information to health care providers, institutions, and/or payers that may pertain to my illness and/or treatment received. I certify that the information I have reported with regard to my insurance coverage is correct, and I have received the pharmacist care/services rendered.

Patient Signature | Date

Pharmacist Care Information

I. REASONS FOR SERVICES

ADMINISTRATIVE

____Call Help Desk	CH
____Drug Not Available	NA
____Missing Information/Clarification	MS
____New Patient Processing	NP
____Non-Formulary Drug	NF
____Payer/Processor Question	TP
____Prescription Authenticity	AN
____Product Selection Opportunity	PS

DOSING/LIMITS

____Excessive Duration	MX
____Excessive Quantity	EX
____High Dose	HD
____Insufficient Duration	MN
____Insufficient Quantity	NS
____Low Dose	LD
____Overuse	ER
____Suboptimal Dosage Form	SF
____Suboptimal Regimen	SR
____Underuse	LR

DRUG CONFLICT

____Additive Toxicity	AT
____Drug-Age Precaution	PA
____Drug-Allergy	DA
____Drug-Disease (Actual)	MC
____Drug-Disease (Inferred)	DC
____Drug-Drug Interactions	DD
____Drug-Gender	SX
____Drug Incompatibility	DI
____Drug-Pregnancy	PG
____Iatrogenic Condition	IC
____Ingredient Duplication	ID
____Lactation/Nursing Precaution	NR
____Prior Adverse Drug Reaction	PR
____Therapeutic Duplication	TD

DISEASE MANAGEMENT

____Additional Drug Needed	AD
____Adverse Drug Reaction	AR
____Apparent Drug Misuse	DM
____Health Provider Referral	RF
____Laboratory Test Needed	TN
____New Disease/Diagnosis	ND
____Patient Complaint /Symptom	CS
____Patient Question/Concern	PC
____Prescriber Consultation	PN
____Suboptimal Drug/Indication	SD
____Unnecessary Drug	NN

PRECAUTIONARY

____Alcohol Precaution	OH
____Drug-Food Interaction	DF
____Drug-Lab Conflict	DL
____Side Effect	SE
____Tobacco Use Precaution	DS
XX Other (specify below)	96

Contraindication

II. PROFESSIONAL SERVICES

ADMINISTRATIVE

____Formulary Enforcement	FE
____Generic Product Selection	GP
____Literature Search/Review	SW
____Patient Medication History	PH
____Payer/Processor Consulted	TC
____Therapeutic Product Interchange	TH

PATIENT CARE

____Coordination Of Care	CC
____Medication Review	MR
____Patient Assessment	AS
____Patient Consulted	P0
____Patient Education/Instruction	PE
____Patient Monitoring	PM
____Perform Laboratory Test	PT
____Pharmacist Consulted Other Source	R0
XX Prescriber Consulted	M0
____Recommended Laboratory Test	RT
____Self-Care Consultation	SC
____Other (specify below)	97

III. RECOMMENDATIONS

DISPENSED

____Override - Conflict Invalid	XA
____Override - Conflict Not Significant	XB
____Change Dose	XC
____Change Directions	XD
____Change Drug	XE
____Change Quantity	XF
____Review Prescription w/Prescriber	XG
____Substitute a Generic	XH
____Change to OTC Product	XJ

NOT DISPENSED

XX Do Not Dispense Drug	YA

PATIENT CARE

____Perform Patient Care Service	ZA
____Discontinue Drug	ZC
____Change Regimen	ZD
____Change Therapy	ZE
____Change Therapy to More Effective and More Costly Drug	ZF
____Continue Without Change	ZG
____Extensive, Report Will Follow	ZH
____Refer Patient to Another Professional	ZJ
XX Other (specify below)	98

Cancel V/Q Scan

IV. RESULTS OF SERVICES

DISPENSED

____Filled As Is, False Positive	1A
____Filled Prescription As Is	1B
____Filled, With Different Dose	1C
____Filled, With Different Directions	1D
____Filled, With Different Drug	1E
____Filled, With Different Quantity	1F
____Filled, With Prescriber Approval	1G
____Brand-to-Generic Change	1H
____Rx-to-OTC Change	1J

NOT DISPENSED

XX Prescription Not Filled	2A
____Not Filled, Directions Clarified	2B

PATIENT CARE

XX Recommendation Accepted	3A
____Recommendation Not Accepted	3B
____Discontinued Drug	3C
____Regimen Changed	3D
____Therapy Changed	3E
____Therapy Changed - Cost Increase Acknowledged	3F
____Drug Therapy Unchanged	3G
____Follow-Up Report	3H
____Patient Referral	3J
____Other (specify below)	99

V. LEVELS OF SERVICES (OPTIONAL)

Level 1 (Lowest)	= 11
Level 2	= 12
Level 3	= 13
Level 4	= 14
Level 5 (Highest)	= 15

Values of these optional codes will be assigned by trading partners who choose to use them.

VI. DRUGS INVOLVED (IF APPLICABLE)

	NDC	NDC
1.	4432	
2.	513075	
3.		

VII. BILLING CODES/PROFESSIONAL FEES

	FEE
1.	
2.	
3.	

TOTAL FEE ▶

DISCUSSION

O: Patient with Lung CA and multiple mets. S/P lobectomy and XRT x 33 doses. Now with pulmonary HTN, probably secondary to right ventricular strain. ?? etiology of pulm HTN, R/O PE.

A: 99mTc Aggregated Albumin contraindicated in Pulmonary HTN due to decreased diameter of pulmonary capillaries. Probably exacerbated in this case due to XRT and lobectomy.

P: Cancel V/Q Scan.

I am certified to provide: ☐ Cardiovascular care ☐ Diabetes care ☐ Orthotics/prosthetics care ☐ Ostomy, incontinence, wound care ☐ Respiratory care ☒ Other Nuclear Pharmacy Care (BCNP)

Pharmacy Imprint

NAME | TELEPHONE

ADDRESS

NABP NO. | SSN/TIN

I hereby certify that the pharmacist care rendered as indicated has been completed and the fees submitted are the actual fees I have charged and intend to collect for those services.

Signature of Pharmacist ▶

Date | Pharmacist I.D.

WHITE - PAYER YELLOW - PATIENT PINK - PHARMACY/OTHER

Reorder From MED-PASS 800-338-3884 FAX (513) 338-8361 Med-Pass Form # ND1203
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QUESTIONS

1. The patient's problem list can include:

   a. patient concerns
   b. health professional concerns
   c. abnormal lab values
   d. all of the above

2. Information included in the Subjective portion of the SOAP Note is most often obtained by:

   a. reading physician progress notes
   b. reading typed consultations
   c. interviewing the patient
   d. reading the nurses notes

3. Information included in the Subjective portion of the SOAP N is:

   a. measurable
   b. objectively verifiable
   c. a & b above
   d. not measurable or objectively verifiable

4. Information in the Objective portion of the SOAP Note includes:

   a. past medical history, medication administration record
   b. vital signs, lab results, drug levels
   c. imaging results, consultant notes
   d. discharge report, patient's physical appearance

5. The information in the Objective portion of the SOAP Note is:

   a. measurable
   b. objectively verifiable
   c. a & b above
   d. not measurable or objectively verifiable

6. The pharmacist must be familiar with the _____ information in the patient's record in order to determine if there are any medication related problems.

   a. subjective and objective
   b. detailed and superfluous
   c. descriptive and anecdotal
   d. questionable and unverified

7. A pharmacist is going to write a therapeutic recommendation in the patient's medical record. The justification for the recommendation will be included in the _____ section of the SOAP Note.

   a. Subjective
   b. Objective
   c. Assessment
   d. Plan

8. JB is a 54 y/o white male who complains of chest pain at his most recent visit to his family physician. He is otherwise healthy and in no acute distress. His past medical history includes a broken leg at 16 and mild arthritis, while his social history includes 3-6 cups of coffee a day and 1-2 caffeine containing soft drinks a day. He takes no prescription medication but takes enteric coated aspirin as needed for his arthritic pain. His family physician schedules him for a Dipyridamole (Persantine®) - Thallium Stress Test.

   This patient's problem list will include:

   a. recent onset of chest pain, mild arthritis, significant caffeine intake
   b. recent onset of chest pain, mild arthritis
   c. recent onset of chest pain
   d. chest pain, arthritis, caffeine intake, taking enteric coated aspirin

9. The nuclear pharmacist assesses patient JB's information and determines that the _____ may cause a problem with the nuclear medicine procedure.

a. arthritis
b. history of a broken leg
c. aspirin
d. caffeine

10. In his SOAP NOTE the nuclear pharmacist will recommend:

a. treat arthritis with NSAID
b. discontinue aspirin once NSAID started
c. discontinue caffeine ingestion 24 hours prior to dipyridamole-thallium study
d. discontinue caffeine ingestion 72 hours prior to dipyridamole-thallium study

11. CB is a 57 y/o white female who has been treated for the past 5 years for hypertension, hypothyroidism and arthritis. Her home medications are: captopril 25 mg BID, thyroxine (Synthroid®) 0.125 mg qd, and enteric coated aspirin 1 or 2 prn pain. At her most recent physician's visit she complains of chest tightness with occasional pain. Her physician schedules a Dipyridamole (Persantine®) - Thallium Perfusion Scan. The morning of her study she needs to take some enteric coated aspirin while waiting in nuclear medicine. She forgot her EC aspirin at home, but the Nuclear Medicine receptionist offers her some Anacin®. The nuclear medicine technologist calls for your advice, which is,

a. don't take the Anacin®, it contains caffeine and will interfere with the study.
b. if the patient has ingested the Anacin®, reschedule for tomorrow
c. advise patient to take no OTC analgesics containing caffeine
d. all of the above

12. A 60 y/o black male with mild renovascular hypertension and coronary artery disease is on the following medications: Capozide® 25-25 qd, enteric coated aspirin 81 mg qd and nifedipine (long acting) 30 mg qd. At his last office visit the patient's serum creatinine and BUN are increased and his physician is concerned about renal failure secondary to increased arterial stenosis. The patient is scheduled for a captopril renal scan and you are requested to review the patient's medication and to make recommendations as needed. Your assessments and plan includes:

a. Continue nifedipine and EC ASA as ordered, stop Capozide® 48.0 hours prior to study.
b. Current drug therapy needs no changes, proceed with nuclear medicine study.
c. Continue nifedipine and EC ASA as ordered, do not take Capozide® the morning of nuclear medicine study.
d. Continue nifedipine and EC ASA as ordered, stop Capozide® 24.0 hours prior to study.

13. A 25 y/o white male is recovering from a gun shot wound to the abdomen. He has been fed via hyperalimentation fluids since surgery four weeks ago. He now complains of right upper quadrant pain and his surgeon wants to perform a nuclear medicine hepatobiliary study.

You review this case and offer the following assessment:

a. Anticipate no problems with nuclear study, proceed as scheduled.
b. Nutritional therapy for 4 weeks may result in non visualization of gall bladder, reschedule nuclear procedure after patient eating by mouth for one week.
c. Nutritional therapy for 4 weeks may result in non visualization of gall bladder, consider using cholecystokinin (sincalide) as pharmacologic adjunct.
d. Nutritional therapy for 4 weeks may result in non visualization of gall bladder, consider using meperidine HCl as pharmacologic adjunct.

14. The nuclear medicine procedure is performed using cholecystokinin as an adjunct. The recommended dose of cholecystokinin (sincalide) is 0.02 mg/kg. The patient weighs 150 lbs. and is administered 2.0 mg of the drug. You review this case and determine that this is a Medication Related Problem # _____, _____.

a. 2, improper drug selection
b. 3, subtherapeutic dosage
c. 5, overdosage
d. 8, drug use without indication

15. Oncology patients who have either primary or metastatic bone involvement may experience hypercalcemia. Which of the following drugs used to treat the hypercalcemia may interfere with the nuclear medicine bone scan?

a. dexamethasone
b. hydrocortisone
c. pamidronate
d. all of the above

16. A 55 y/o white male with diabetes mellitus is admitted with cellulitis and possible osteomyelitis. He is an insulin dependent diabetic (for 20 years). This is his first admission with a "non-healing" sore that is a result of a mountain bike accident approximately 1.5 weeks ago. At the time of the accident, he did not seek medical attention and his self care included washing the affected area and application of OTC antibiotic ointment twice a day. His diabetes is well controlled as indicated by a glycosylated hemoglobin of 6.2% and the only laboratory test not within normal limits is his white blood cell count which is slightly elevated at 12,500/mm^3. You are consulted on this case regarding the appropriate radiopharmaceutical to rule out osteomyelitis. Based on the above objective data, you recommend:

a. ^{67}Ga-citrate
b. ^{111}In leukocytes
c. ^{99m}Tc leukocytes
d. ^{99m}Tc MDP three phase bone scan

17. Your recommendation in the prior question was based on the assessment which included:

a. patient problem is acute
b. WBC only mildly elevated
c. diabetes well controlled
d. all of the above

18. A 75 y/o diabetic patient is admitted with cellulitis and osteomyelitis on his left lower extremity which is confirmed by the ^{99m}Tc MDP three phase bone scan. His WBC are markedly elevated at 20,000/mm3 and his temperature has ranged from 99°-102°F. He has been on broad coverage antibiotic therapy but his care givers are considering amputating the limb. He has compromised circulation (as per Doppler) in his left lower extremity and you are consulted by the surgeon regarding what imaging radiopharmaceutical to use to determine the extent of the bone infection. Upon assessing the above case your recommendation is:

a. ^{67}Ga-citrate
b. ^{111}In leukocytes
c. ^{99m}Tc leukocytes
d. any of the above

19. In the previous case your patient problem list included: 75 y/o diabetic with cellulitis and osteomyelitis and your assessment and recommendation was based on the following objective data:

a. compromised circulation
b. elevated temperature
c. elevated WBC
d. all of the above

20. In the previous case, which of the following objective information had the least importance in influencing your recommendation:

a. broad antibiotic coverage
b. compromised circulation
c. elevated temperature
d. elevated WBC

21. Which of the following classes of nuclear medicine procedures can be utilized as a starting point for pharmaceutical care:

a. ^{99m}Tc DTPA Renal Scans
b. ^{99m}Tc Gluconate Renal Scans
c. ^{201}Thallium Perfusion Imaging
d. ^{99m}Tc Sulfur Colloid Liver Imaging

22. Appropriate objective data on a patient is required as part of the pharmaceutical care process. The most logical health practitioner the nuclear pharmacist should communicate with is:

a. nuclear medicine physician
b. pharmacist clinician
c. nuclear medicine technologist
d. patient's nurse

23. Documentation of a pharmacist's interventions is mandatory, especially if reimbursement is desired. In order to assist in this documentation the following can be used:

a. Physician Progress Notes
b. Pharmaceutical Care Plan Form
c. Patient's Medication History
d. Nurse Progress Note

24. In order to strengthen your request for reimbursement, the "Discussion" section of the **Pharmacist Care Claim Form** should include:

a. 20 word narrative
b. 150 word narrative
c. numerical list of your intervention (1, 2, 3, etc.)
d. SOAP NOTE

25. Typically, all that may be needed of a pharmacist to obtain reimbursement for cognitive services is:

a. state licensure
b. board certification
c. clinical hospital appointment
d. provider number