A Method of Documenting Pharmaceutical Care Utilizing Pharmaceutical Diagnosis

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This paper proposes an outline for writing-up a patient case that can be used by experienced pharmacy practitioners, or by students during case-study courses or clerkship training. When such written documentation is placed in the patient’s primary medical record it not only communicates pharmacotherapeutic evaluations and treatment recommendations but also serves as a record of pharmaceutical care. The well-known SOAP outline, even in an expanded format, is not satisfactory for pharmacy because it uses clinical information to characterize medical diagnoses rather than drug-related problems. The key element of the write-up is pharmaceutical diagnoses. Pharmaceutical diagnoses define the nature of specific drug-related problems. Each diagnosis serves as a foundation for desired outcomes, treatments, monitoring parameters, and subjects for patient counseling and education.

INTRODUCTION
In 1995, four semesters of case study courses were introduced into the curriculum of the College of Pharmacy at Idaho State University. Faculty debated whether to use the medical SOAP format or devise a new method of written documentation based on the “pharmacists workup of drug therapy(1).” The issue was never resolved. In the case study course, students are required to learn three different ways to write-up a patient case and clerkship faculty continue to use a variety of methods. The problem of students being exposed to differing methods of written documentation is not unique to Idaho State University. Prosser et al. developed a team-taught elective pharmacy course, for which a major
goal was to develop professional writing skills. They concluded that one reason students found it difficult to write a “chart ready” note was that “each faculty member presented a different perspective on the optimal format.” They also found that “writing skills, like clinical assessment skills, are not easily acquired; it is a difficult and complex process.”

Subsequently, over the last two years, a considerable amount of time has been spent conducting a literature search, studying published methods of documentation, conducting discussions with faculty, and field testing different methods with both case study and clerkship students. The following outline is a culmination of this effort. Although not yet the standard for the College of Pharmacy, it has been favorably received by both students and faculty.

To write-up a patient case, effective organization and a well-developed flow of thought are very important. As in any written composition, pharmacy documentation requires a proper introduction, relevant information, clear reasoning and a conclusion. Many acronyms have been coined that suggest the proper steps to follow when writing-up a patient. For example, the SOIP, later changed to the well-known SOAP (subjective, objective, analysis, plan), was originally designed by Dr. Lawrence L. Weed for medical doctors. Other outlines include an expanded-SOAP (adds goals, monitoring and education), HOAP (replaces subject and objective with history and observations), SOAPIER (used by nursing: adds implementation, evaluation, revision), DAR (used by nursing: data, action, response), FARM (findings, assessment, resolution, monitoring), and PWDT (pharmacist’s workup of drug therapy). These various approaches all contain important elements of documentation, but they all suffer from one or more deficiencies. The original SOAP concentrates on development of a medical diagnosis rather than drug-related problems or pharmacotherapeutic assessment. The expanded SOAP and FARM emphasize therapeutic problems, but continue to be organized around medical diagnoses. The PWDT is a lengthy “thought process that is meant to serve as a guide for the documentation of clinical pharmacy activities and not simply a form to be completed on each patient seen by a pharmacist.”

These new formats use the following outline. In order to remember the steps in this outline one might use the following mnemonic “PH-MD-ROME.”

- Patient Introduction
- Health Problems
- Medications
- Pharmaceutical Diagnoses
- Recommended Orders
- Desired Outcomes
- Monitoring
- Patient Counseling and Education

### Patient Introduction

The “Patient Introduction” module introduces the health professional to the patient. It provides a thumbnail sketch of the patient’s appearance and the situations that motivated the patient to seek care. It also lays the groundwork for what the pharmacist-patient relationship might involve. The following questions are included in this section: date of birth, race, height, weight, admission date (applicable for inpatients), gender and Chief Complaint (CC) or a description of the patient’s present state. The patient’s last name may be used in the remainder of the documentation. It is also common to refer to “the patient,” or to use the patient’s initials.

### Health Problems

Health problems may include a medical diagnosis, psychiatric diagnosis, patient complaint, an abnormal laboratory test result, an abnormal observation (sign or symptom), a social or financial situation, a psychological concern, or a physical limitation/disability. Sometimes it is necessary for a
pharmacist to perform a physical or psychological examination or question the patient about his or her medical history. Documentation of these activities should be recorded within this module. If the patient has an allergy, this should be noted as the last item. If the patient has no known allergies, this should also be noted as confirmation that the pharmacist has sought a history of allergies.

Each health problem should be titled and placed in order of clinical significance. Health problems should not be numbered because they are not the emphasis of the write-up, and it would lead to confusion when problems are numbered in the pharmaceutical diagnosis module.

At this location in the write-up, information on the patient’s medical history is integrated with recent observations in order to characterize the current health problem. Besides presenting clinical findings, there is often a need to interpret or explain the data. For example, in both versions of the case, the patient’s chronic bronchitis is attributed to smoking and the acute exacerbation is hypothesized to be due to a viral infection and not a bacterial pneumonia. In the modular format of the case, there is also an explanation that the increased serum bicarbonate is due to renal compensation, and that the patient’s mood and symptoms are compatible with diagnostic criteria for depression.

Students often scatter relevant health information throughout their write-ups. By putting the information supporting a particular health problem in only one location, several pharmaceutical diagnoses can refer to the same health/disease information without unnecessary duplication. For example, in the expanded SOAP format we find fragmented information about the patient’s chronic bronchitis in the past medical history, social history, physical examination, laboratory tests, and in the “S,” “O,” and “A” of the SOAP under “Problem 1. Chronic Bronchitis Exacerbation.” While in the modular approach, all of this information is organized under “Chronic Bronchitis in an Acute Exacerbation.”

Drug treatment is not discussed in the health problems module. Past and present drug treatment will be listed in the medications module and discussed, if necessary, in the pharmaceutical diagnoses module. At this point, a health professional needs to develop an in-depth understanding of both the past course and present manifestations of the patient’s medical/psychiatric problems without being distracted by a discussion of pharmacotherapeutics.

Identification of information as subjective, objective, a symptom or a sign has been overemphasized in the SOAP-type of note(6). The patient’s complaints and point of view are essential information, but they do not influence how the write-up is organized in the modular approach. Rather than concentrating and organizing information by type (i.e., subjective versus objective) observations should be organized in a way that clarifies the relevant pathophysiology and supports therapeutic discussions found in the pharmaceutical diagnoses module.

Medications

The medication module is broken down into two sections; the present medication list and the past medication list. The present medication list can be used as a screen for drug interactions, duplication of therapy, polypharmacy, allergies, and appropriate dosage.

In order to develop a past medication list a complete drug history should be obtained. Drug histories are one of the more important tools for developing and assessing possible drug-related problems(12). The pharmacist should not only determine the details of the past dosage regimens but also investigate how well those regimens worked, the details of any adverse events, and why the patient is no longer taking the medications. The pharmacist should also assess patient knowledge, discover practical impediments to optimal drug utilization, and determine if there are attitudinal barriers that might have an impact on compliance(13).

Pharmaceutical Diagnoses

Early in the development of clinical pharmacy practice, medical diagnoses were used as the focus of thought processes involved in establishing a systematic approach to drug therapy(14). The pharmaceutical care movement has stimulated pharmacy to reconsider and re-conceptualize the type of problems that fall within the scope of pharmacy practice.

Strand et al. defined a drug-related problem as “an undesirable event, a patient experience that involves, or is suspected to involve drug therapy, and that actually, or potentially, interferes with a desired patient outcome.”(15) The authors further state that “some relationship must exist (or be suspected to exist) between the undesirable event and drug therapy. The nature of the relationship will depend upon the specific drug-related problem, but common relationships between an undesirable event and drug therapy are: (i) the event is the result of drug therapy; and (ii) the event requires drug therapy.”(15)

The original list of eight drug-related problems defined by Strand et al. may be a good heuristic method to “provide order in a pharmaceutical universe considered by many to be chaotic,”(16) but it does not give many choices for titling the numerous kinds of situations that could exist between drug therapy and an undesirable event.

Pharmaceutical diagnosis is a concept discussed by Culbertson et al.(17). In the past, pharmacists have avoided the word “diagnosis” because diagnosis is supposed to be only done by physicians. If medical diagnosis is defined by Stedman’s Medical Dictionary(18) as the “determination of the nature of a disease,” what would pharmacy diagnosis be?

Culbertson et al. defined pharmaceutical diagnosis as “a problem-centered, cognitive process used to identify patient-specific, drug-related problems,” and further proposed 23 pharmaceutical diagnostic categories organized under seven general domains(17). They stated that the suggested diagnostic definitions were preliminary and “it is conceivable that different definitions or an entirely new structure may eventually emerge.” Table I contains an expanded list of 42 possible pharmaceutical diagnosis with brief definitions. These were developed from a review of the literature (8,11,17,19) and tested by pharmacy students in numerous simulated and actual patient cases.

In the narrative under each pharmaceutical diagnosis, the pharmacist should provide adequate evidence supporting the existence of a drug-related problem, and therapeutic principles that will be used as a basis for solving the problem. For example, the patient in the case exhibits a maculopapular rash. Both case formats conclude that the timing of the rash is compatible with the initiation of doxycycline. Is this enough evidence to convince a reader that the rash was due to doxycycline rather than warfarin, terbutaline or acetaminophen? If the writer had done a comprehensive assessment
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Related to Medical Diagnosis</strong></td>
<td></td>
</tr>
<tr>
<td>Incomplete medical evaluation</td>
<td>Physician has not completed a diagnostic workup needed for evaluation of drug therapy.</td>
</tr>
<tr>
<td>Uncharacterized signs and symptoms</td>
<td>Physician has not yet initiated a diagnostic workup needed for evaluation of drug therapy.</td>
</tr>
<tr>
<td><strong>Related to the Prescription</strong></td>
<td></td>
</tr>
<tr>
<td>Unclear or incomplete prescription</td>
<td>A prescription order is lacking essential information or needs clarification.</td>
</tr>
<tr>
<td>Suboptimal dosage form</td>
<td>There is a better dosage form or route i.e. parenteral, sustained release, liquids, tablets, capsules, flavor, topical, suppositories etc.</td>
</tr>
<tr>
<td>Not receiving</td>
<td>A drug has been recommended or prescribed but not dispensed, administered or refilled. Apply the poor compliance diagnosis when the patient is responsible for not taking the medication.</td>
</tr>
<tr>
<td>Suboptimal dosage schedule</td>
<td>Dosage schedule is either inconvenient or does not result in optimal pharmacokinetic or pharmacodynamic profile.</td>
</tr>
<tr>
<td>Subtherapeutic dose</td>
<td>Considering all patient-specific factors, the dosage is below that which normally will produce or sustain a satisfactory outcome.</td>
</tr>
<tr>
<td>Excessive dose</td>
<td>Considering all patient-specific factors, the prescribed dosage is higher than usually needed to produce satisfactory outcome and/or may place the patient at risk for an ADR.</td>
</tr>
<tr>
<td>Excessive duration of use</td>
<td>Drug is no longer needed.</td>
</tr>
<tr>
<td>Insufficient duration of use</td>
<td>Drug was discontinued before desired outcome could be attained.</td>
</tr>
<tr>
<td>Unidentified medication</td>
<td>The patient does not know the name of a medication nor can it be easily identified by physical appearance.</td>
</tr>
<tr>
<td><strong>Related to Evaluation of Drug Therapy</strong></td>
<td></td>
</tr>
<tr>
<td>Untreated health problem</td>
<td>An indication exists for drug or non-drug therapy. This diagnosis usually applies to a newly characterized health problem. However, it could apply to an older health problem if no other diagnosis is more descriptive of why the health problem is untreated.</td>
</tr>
<tr>
<td>Need for prophylactic/preventative/continuation/or maintenance therapy</td>
<td>“Preventative” and “prophylactic” are often interchangeable, continuation suppresses relapse while disease is in remission, maintenance reduces recurrences after patient recovers.</td>
</tr>
<tr>
<td>Suboptimal response</td>
<td>Clinical evidence argues that the present drug treatment has been given an adequate trial in regard to dose and duration but does not meet desired outcomes related to efficacy.</td>
</tr>
<tr>
<td>Questionable indication</td>
<td>No apparent health problem for which the drug might be used.</td>
</tr>
<tr>
<td>Uncertain indication</td>
<td>Several health problems exist for which the drug might be used.</td>
</tr>
<tr>
<td>Lacking justification</td>
<td>An indication exists, but the literature strongly argues that the drug is either not very effective and/or has a high risk of adverse effects compared to other available alternatives.</td>
</tr>
<tr>
<td>Questionable justification</td>
<td>An indication exists, but the literature suggests that other alternatives are more effective and/or safer.</td>
</tr>
<tr>
<td>Duplication of action</td>
<td>Two drugs are being given. One drug is sufficient, the other is probably not needed.</td>
</tr>
<tr>
<td>Lacking pharmacokinetic evaluation</td>
<td>Pharmacokinetic parameters need to be estimated and used to evaluate dosage and/or drug levels.</td>
</tr>
<tr>
<td><strong>Related to Adverse Effects of Drug Therapy</strong></td>
<td></td>
</tr>
<tr>
<td>Adverse drug reaction</td>
<td>An adverse drug reaction (ADR) is possibly, probably or definitely occurring. The undesirable event is caused by a drug, unintended, noxious, and results in an adverse outcome.</td>
</tr>
<tr>
<td>Absolute contra-indication</td>
<td>The patient is at high risk for an ADR the etiology of which would involve a drug/disease interaction.</td>
</tr>
<tr>
<td>Relative contra-indication</td>
<td>The patient is at moderate risk for an ADR the etiology of which would involve a drug/disease interaction.</td>
</tr>
<tr>
<td>Potential adverse drug/diet interaction</td>
<td>The patient is at risk for an ADR the etiology of which would involve diet.</td>
</tr>
<tr>
<td>Potential adverse drug/drug interaction</td>
<td>The patient is at risk for an ADR the etiology of which would involve an interaction between drugs.</td>
</tr>
<tr>
<td>Potential drug/laboratory interaction</td>
<td>The patient is at risk for an ADR, the adverse event would be an altered laboratory measurement.</td>
</tr>
<tr>
<td><strong>Related to Monitoring</strong></td>
<td></td>
</tr>
<tr>
<td>Need for prophylactic monitoring</td>
<td>Patient is at risk for acquiring a health problem that would need drug therapy.</td>
</tr>
<tr>
<td>Inadequate monitoring of clinical data</td>
<td>Need for systematic observations of subjective and/or objective clinical data to either characterize a health problem, evaluate drug therapy or determine if desired outcomes are being met.</td>
</tr>
<tr>
<td>Excessive monitoring of clinical data</td>
<td>Some clinical measurements related to drug therapy are not necessary, resulting in increased cost, and/or inconvenience, and/or risk to the patient.</td>
</tr>
<tr>
<td>Inadequate therapeutic drug monitoring</td>
<td>Systematic measurements of drug concentrations are needed for pharmacokinetic calculations or to assure that drug levels remain within the established therapeutic range.</td>
</tr>
</tbody>
</table>
of the potential adverse drug reaction it would have required evaluation of at least four pieces of evidence, only one of which is the temporal relationship between drug use and an adverse event(20). Therefore the present case material might be adequate for communication between health professionals that trust each other’s judgment but might not be satisfactory when the intended reader has not developed confidence in the pharmacist’s capabilities.

Establishment of a pharmaceutical diagnosis narrows the options for therapy. However, there are always several ways to solve a problem. If a drug is to be initiated, modified, or discontinued, the benefits and risks should be discussed. Therapeutic principles should be explained in enough detail to educate or convince other health professionals that the rationale is appropriate. A limited discussion and comparison of alternate solutions may help clarify desirable options. However, extensive information about alternate drug therapy need only be included if there is a chance that a drug of first choice may not meet expectations or has a potential to produce significant adverse effects.

Referencing primary literature is an effective way to convince health professionals that your assessments or recommendations are substantiated by current scientific evidence. Primary references report the results of original research, and support an analysis, an evaluation, or an argument in areas that may be controversial, or where uncertainty exists. References should not refer to well-known information that can be found in common medical or pharmacy textbooks or review articles. A primary journal article can be summarized in two sentences. The first sentence describes the study duration, type of study, the number of final patients, type of patients, and the key independent variable. The second sentence provides the key dependent variable, result, and statistical significance.

An example is antibiotic use for chronic bronchitis. The case documentation states that “the use of antibiotics in this situation is controversial.” What does controversial mean? Could the prescriber feel comfortable beginning ampicillin when the risks and benefits are unknown. This would be a good location for the following abstract.

A two-year, double blind, crossover study of 173 patients with stable chronic obstructive pulmonary disease compared antibiotics (TMP-SMX, or amoxicillin, or doxycycline) with placebo during an acute exacerbation. Although resolution of an exacerbation within 21 days occurred in 68 percent of the antibiotic treated patients, versus 55 percent of the placebo treated patients (P<0.01), most of the effect was accounted for by very symptomatic patients(21).

The methodology section within a current primary article can also demonstrate how experts monitor drug therapy and decide when a favorable outcome has been achieved. This type of information is often difficult to extract from product information, textbooks and review articles.

**Recommended Orders**

This and the next three modules (outcomes, monitoring and education) are designed to resolve drug-related problems. Each suggestion within these modules should be preceded by a number corresponding to a pharmaceutical diagnosis. They are organized somewhat like check off lists. Further data analysis, discussions or synthesis of plans would only dilute the impact of proposed actions. Therefore, all narrative should be completed within the preceding health problems module or pharmaceutical diagnoses module.

Recommendations usually deal with medications, but may involve non-drug therapies or another service. Non-drug therapy recommendations might include sending for...
Desired Outcomes

Desired outcomes (also known as objectives or endpoints) should be specific. They should state exactly what changes, or lack of changes, in the monitoring parameters would reasonably document the attainment of adequate therapeutic results, and assure that the patient was not experiencing any significant adverse drug reactions. Whereas monitoring parameters are often repeated measurements, an outcome is a criterion that is applied to one or more of these measurements following a specific time interval. If the outcome is not met it should be reevaluated and a new outcome should be set. Outcomes are similar to mile markers along a highway. They tell whether the patient has progressed to a certain desirable point or not.

The synthesis of patient specific outcomes can only be accomplished after the pharmacist has a clear understanding of the patient’s health problems and pharmaceutical diagnoses. In the context of a pharmacy write-up, analysis should be completed in the health problems and pharmaceutical diagnoses modules. If outcomes are presented too early in the write-up they often turn out to be general health or therapeutic goals and possibly unrealistic for specific patients. For example, in the expanded SOAP version of the case, a goal to “decrease morbidity and mortality associated with chronic bronchitis” is not patient specific. Even refining the goal to “improve respiratory function and prevent a future exacerbation of chronic bronchitis,” or to “optimize bronchodilator therapy” is not much better. In the modular version of the case, the desired outcomes for pharmaceutical diagnosis #1 “Suboptimal Response to Bronchodilators” explicitly state the values we want to achieve for: (i) FEV1; (ii) respiratory rate; and (iii) arterial blood gases.

Monitoring

Monitoring parameters are those laboratory tests, clinical measurements, and observations that are to be prospectively followed in order to provide feedback on the status of the patient’s health problems and pharmaceutical diagnosis. Each parameter should include the time when it will be obtained and by which health professional, if that is not implicitly clear. The most important monitoring parameters are those that correspond to the outcomes above. Each monitoring parameter (or a few related parameters) should be written on a separate line so that the result can be used as a check off list. In the expanded SOAP, notice how the monitoring parameters were presented for “Problem 1. Chronic Bronchitis Exacerbation.” They are all mixed up in one sentence. Now look at the modular write-up. As you can see, they are basically the same parameters, but some are done daily, and some only once, at a specific time. The parameters to be done by the laboratory is clearly indicated.

Terminology should be avoided that is general and may not be uniformly interpreted by different readers. For example, in the expanded SOAP format under monitoring for depression, how should we measure “quality of life?” There are published rating scales for quality of life. Are we going to use one of those, or are we just going to ask the patient about his quality of life? Under monitoring for side effects, what is meant by “anticholinergic side effects?” Anticholinergic side effects cover a broad range of symptoms. It would be better to select and specifically monitor a few of the more common anticholinergic side effects.

In the ambulatory setting, a patient may not return to see the pharmacist for weeks or months. Between visits, the patient must be counseled to report if a health problem does not resolve, or if side effects occur. Although this type of advice appears to be monitoring, it should be placed in the next module “patient counseling and education.”

Patient Counseling and Education

This module lists specific, unique, and important information, advice, training, and encouragement that the pharmacist will provide to the patient. The purpose of counseling is to help the patient take appropriate responsibility for the proper management of his or her illness and for recognizing and dealing with side effects of medications. If there is a diagnosis of “poor compliance,” or a diagnosis related to patient counseling, then the patient counseling module must contain directions for correcting the problems.

A pharmacist does not have to prepare a written list of all the subjects that are mandated in The Omnibus Budget Reconciliation Act of 1990(22). However, the pharmacist will be responsible for discussing these items with the patient. For a general review of patient counseling, the reader is referred to the ASHP Guidelines on Pharmacist-Conducted Patient Education and Counseling(23).

The wording of this module should indicate if patient counseling has already been completed. If it has been completed, the write-up should document the patient’s acceptance and apparent understanding of the information. If patient counseling is performed at some later time the pharmacist should return to the patient’s record and write a progress note confirming that the counseling was done, the date completed, and the pharmacist’s initials.

SUMMARY

A pharmacist must know what to write before sitting down and completing the document. This requires a thoughtful assessment of all available information in patient medical records, a discussion with the physician and other caregivers, and an interview with the patient. As the pharmacy student or pharmacist becomes proficient, fewer notes and rough drafts will be needed and the content and ideas will be easier to keep organized in his or her head. Although the modular approach does not necessarily represent a thought-process for problem solving, the concepts embodied in the method will hopefully result in a written product that more effectively communicates the results of such cognitive processes. Very little in a write-up can be simply copied down from the chart or other sources of patient information. The truly
valuable information in a write-up is the ideas generated by the pharmacist.

In case study courses and clinical clerkships, a comprehensive write-up may be many pages long. In the real world of pharmacy practice, a complete patient evaluation may be limited to one or two pages, and progress notes condensed to just a few paragraphs. Progress notes may not use all the modules; however, they should still include at least one pharmaceutical diagnosis. In a progress note the pharmacist may document changes in health problems, update pharmaceutical diagnoses, recommend new orders, document whether outcomes have been attained, report the results of monitoring, or record the success of patient counseling.

The modular write-up produces a document with an organized source of patient data, clear problem identification, and an explicit set of actions taken to resolve problems. Summary reports based on a number of write-ups could be used to evaluate type of care provided, patient outcomes, work load, costs and quality of care. Reimbursement or funding for non-dispensing, clinical service continues to be an important goal for pharmacy. Just as the medical progress note and medical diagnosis are used for physician reimbursement, pharmacy documentation and pharmaceutical diagnosis could serve the same function for pharmacists.

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References


(3) Weed, L.L., Medical Records, Medical Education and Patient Care, Case Western Reserve Press, Cleveland OH (1970).


APPENDIX: PATIENT CASE WRITTEN IN TWO DIFFERENT FORMATS

I. MODULAR FORMAT

PATIENT INTRODUCTION

Date 2/24/97

K.H. is a 52-year-old, 80 kg, 5’7’’ male who comes to the clinic today with continued complaints of shortness of breath and increased sputum production.

He reports that a rash began yesterday. He also complains of feeling depressed, lacking energy, waking up early in the morning and not being able to go back to sleep, a decreased appetite, and a general lack of interest in everything, including his job and his family for the last 6 weeks. Although he has several medical problems, he has been doing well prior to this episode.

HEALTH PROBLEMS

Chronic Bronchitis in an Acute Exacerbation

SOB has been increasing over the last two years. The present respiratory rate is increased to 32. K.H. continues to smoke 1 pack per day. He has 50 pack-year history. Smoking is the most likely etiology of the chronic bronchitis. Numerous rales, rhonchi, and wheezes are heard on auscultation. Hct and Hgb are in the upper normal range ruling out anemia as a cause for the SOB. Their elevation is probably secondary to hypoxia.

Arterial blood gases indicate poor gas exchange, Pco2 is increased to 49 mmHg (normal 35-45), and P02 is decreased to 55 mmHg (normal 80-100). An increased bicarbonate of 28 mEq/L (normal 20-26) shows compensation by the kidney resulting in a pH of 7.37, which is low-normal.

WBC and differential are normal, temperature is normal, and chest x-ray is clear ruling out pneumonia. Gram stain of sputum sample was unsuitable due to numerous squamous epithelial cells A viral upper respiratory tract infection may be the cause of the acute exacerbation.

A pre-bronchodilator FEV1 = 2000 mL (50% of VC) indicates obstruction. However a post-bronchodilator FEV1 = 2600 mL (65% of VC) shows that this obstruction has a reversible component.

Rash

K.H. does not complain of itching. He has a maculopapular rash on trunk and thighs. His eosinophiles are in the normal range.

Depression

The five symptoms mentioned under patient introduction and...
their duration of over six weeks are consistent with a major depressive episode. However his breathing problem may be contributing to the mood disorder. The patient does not appear to be suicidal at this point.

**Deep Vein Thrombosis**

Patient injured his right leg in a fall seven months ago. Deep vein thrombosis in the calf developed a week later. The measurements of INR have shown wide swings over the last seven months. Presently the INR has stabilized around 3.0 for the last two months.

**No Known Allergies**

**MEDICATIONS**

**Present Medication List**
- Theodur 600 mg bid for 2 years
- Terbutaline inhaler 4 puffs qid and PM for 2 years
- Vibramycin 100 mg qd for bronchitis x 10 days
- Warfarin 3 mg qd, started seven months ago
- Acetaminophen prn HA

**Past Medication List**
- Unknown

**PHARMACEUTICAL DIAGNOSIS**

1. **Suboptimal Response to Bronchodilators**
   - K.H. has a symptomatic exacerbation of his chronic bronchitis that requires further treatment. The reversible airway obstruction would probably be amenable to additional bronchodilators. A theophylline level of 12 mg/L is within the therapeutic range and pharmacokinetically consistent with his dosage. The use of antibiotics in this situation is controversial, although recent evidence suggests a benefit.

2. **Adverse Drug Reaction to Doxycycline**
   - K.H. has developed a rash probably due to the doxycycline started 9 days ago. The usual drug rash is maculopapular and commonly occurs after 7-10 days of therapy. Avoid antihistamines unless K.H. is itching, because they are sedating and have anticholinergic effects.

3. **Untreated Depression**
   - K.H. has had his current complaints for more than a month. While he does not appear to be suicidal at this point, he needs treatment. Fluoxetine is as effective, has less side effects, and, when all costs are taken into account, is no more expensive to use than older tricyclic antidepressants such as imipramine and desipramine.

4. **Excessive Duration of Warfarin Prophylaxis**
   - Since the patient has only had one occurrence of deep vein thrombosis, warfarin therapy is usually discontinued after six months of prophylactic treatment

**RECOMMENDED ORDERS**

1. Methylprednisolone 45 mg iv stat and continue q 6 h for 72 hours.
   - Aerosolized metaproterenol 4 puffs stat and 1 puff q 5 minutes until relief or side effects, then two puffs every 4 hours while awake.
   - Continue oral theophylline, 600 mg bid.
   - Oxygen 2 liters/minute via nasal prongs.
   - Ampicillin 500 mg po qid for seven days.

2. Discontinue Vibramycin.
   - Label K.H. allergic to doxycycline.
   - Aveeno baths for a soothing effect as needed.

3. Fluoxetine 20 mg qd in AM or at noon. Continue therapy for 6 months.

4. Discontinue warfarin

**DESIRED OUTCOMES**

1. FEV1 greater than 2000 mL within two days
   - Respiratory rate below 20, within two days
   - ABG should all be within normal ranges within four days

2. Resolution of rash within 5 days

3. Patient’s appetite and sleep moderately improved within one week and mood moderately improved within 4 weeks, with no report of suicidal ideation or side effects listed in monitoring below.

**MONITORING**

While hospitalized

1. Daily, patient’s report of SOB and sputum production
   - Daily, respiratory rate and FEV1
   - Daily, chest auscultation

2. In 4 days, laboratory to measure arterial blood gases

3. Daily, examine rash

4. Daily, dietary to record percent of each meal eaten.
   - Daily, nursing to record hours of sleep the night before
   - Daily, patient report of mood, interest in life, and suicidal thoughts

1 & 3. Daily, patient report of adverse effects: headaches, anxiety, insomnia, nausea, dry mouth, constipation, drowsiness, or dizziness

**PATIENT COUNSELING AND EDUCATION**

1. Assess K.H.’s ability to use his inhaler correctly and correct any problems. Provide a spacer if necessary. Explain the likely side effects of bronchodilators: nausea, palpitations, anxiety or insomnia. K.H. should discontinue smoking; refer him to a smoking cessation clinic.

2. Educate patient that he has an allergy to doxycycline and possibly other tetracyclines.

3. Advise patient to take fluoxetine in the morning or at noon to help prevent insomnia. Antacids may help with nausea. This drug may cause drowsiness or dizziness, so caution is advised when driving or operating machinery. It will take several weeks for this drug to work or side effects to develop.

**2. EXPANDED SOAP FORMAT**

**CHIEF COMPLAINT**

K.H. is a 52-year-old man who comes to the clinic today with complaints of shortness of breath and increased sputum production.

**HISTORY OF PRESENT ILLNESS**

He reports that a rash began yesterday. He also complains of feeling depressed, lacking energy, waking up early in the morning and not being able to go back to sleep, a decreased appetite, and a general lack of interest in everything, including his job and his family for the last 6 weeks. Although he has several medical problems, he has been doing well prior to this episode.

**PAST MEDICAL HISTORY**

Chronic bronchitis secondary to smoking. Increasing SOB over last two years.

Patient injured his right leg in a fall seven months ago. Deep vein thrombosis in the calf developed a week later.

**SOCIAL HISTORY**

K.H. has a stable and happy marriage; he has two sons in college, both doing well. K.H. continues to smoke 1 pack per day; he has 50 pack-year history. K.H. tried marijuana once with his son but did not like it.

**MEDICATION HISTORY**

Theodur 600 mg bid for 2 years
- Terbutaline inhaler 4 puffs qid and PM for 2 years
- Vibramycin 100 mg qd for bronchitis x 10 days
- Warfarin 3 mg qd, started 7 months ago
- Acetaminophen prn headache

**MONITORING**

While hospitalized

1. Daily, patient’s report of SOB and sputum production
   - Daily, respiratory rate and FEV1
   - Daily, chest auscultation

2. In 4 days, laboratory to measure arterial blood gases

3. Daily, examine rash

4. Daily, dietary to record percent of each meal eaten.
   - Daily, nursing to record hours of sleep the night before
   - Daily, patient report of mood, interest in life, and suicidal thoughts

1 & 3. Daily, patient report of adverse effects: headaches, anxiety, insomnia, nausea, dry mouth, constipation, drowsiness, or dizziness

**PATIENT COUNSELING AND EDUCATION**

1. Assess K.H.’s ability to use his inhaler correctly and correct any problems. Provide a spacer if necessary. Explain the likely side effects of bronchodilators: nausea, palpitations, anxiety or insomnia. K.H. should discontinue smoking; refer him to a smoking cessation clinic.

2. Educate patient that he has an allergy to doxycycline and possibly other tetracyclines.

3. Advise patient to take fluoxetine in the morning or at noon to help prevent insomnia. Antacids may help with nausea. This drug may cause drowsiness or dizziness, so caution is advised when driving or operating machinery. It will take several weeks for this drug to work or side effects to develop.

**2. EXPANDED SOAP FORMAT**

**CHIEF COMPLAINT**

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K.H. has a symptomatic exacerbation of his chronic bronchitis. 

PROBLEM 1. CHRONIC BRONCHITIS EXACERBATION

A: K.H. is a 58-year-old man with a history of chronic bronchitis. He has noticed a recent increase in sputum production and a decrease in his forced expiratory volume in one second (FEV1).

O: K.H. reports increased sputum production, wheezing, and dyspnea.

S: K.H. also notes a sense of impending doom and an increased need for oxygen.

PHARMACY-RELATED PROBLEM LIST

1. Chronic bronchitis in an acute exacerbation
2. Drug allergy
3. Depression
4. Deep Vein Thrombosis

RESULTS OF LABORATORY TESTS

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>140</td>
</tr>
<tr>
<td>K</td>
<td>40</td>
</tr>
<tr>
<td>Hct</td>
<td>55</td>
</tr>
<tr>
<td>Alb</td>
<td>4</td>
</tr>
<tr>
<td>Cl</td>
<td>101</td>
</tr>
<tr>
<td>WBC</td>
<td>8.1</td>
</tr>
<tr>
<td>Glu</td>
<td>95</td>
</tr>
<tr>
<td>HCO3</td>
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<td>Po2</td>
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</tr>
<tr>
<td>Pts</td>
<td>305k</td>
</tr>
<tr>
<td>Mg</td>
<td>20</td>
</tr>
<tr>
<td>PT</td>
<td>29(INR=3)</td>
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<tr>
<td>WBC differential:</td>
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</tr>
<tr>
<td>Neutrophils</td>
<td>74</td>
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<tr>
<td>Lymphs</td>
<td>52</td>
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<tr>
<td>Monos</td>
<td>5.4</td>
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<tr>
<td>Eos</td>
<td>0.12</td>
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<td>ABGs:</td>
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</tr>
<tr>
<td>pH</td>
<td>7.37</td>
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<tr>
<td>Po2</td>
<td>55</td>
</tr>
<tr>
<td>Pco2</td>
<td>49</td>
</tr>
<tr>
<td>Gram stain of sputum sample was unsuitable due to numerous squamous epithelial cells</td>
<td></td>
</tr>
<tr>
<td>Urinalysis:</td>
<td>WNL</td>
</tr>
</tbody>
</table>

PHYSICAL EXAMINATION

- Middle aged man, in severe distress
- BP 120/80, HR 100, T 37.6
- Middle aged man, 5'7" tall, 80 kg weight

CHEST: Numerous rales, rhonchi, and wheezes

ABD: No organomegaly

GU: WL

NEURO: Oriented x 3, WNL

NEURO: Oriented x 3, WNL

RESULTS OF LABORATORY TESTS

- Serum electrolytes: Na 140, K 4.0, HCO3 28
- Hgb 17.5
- TBili .8
- Cl 101
- Glu 95
- Uric acid 7.4
- Ca 8.8
- BUN 37
- Mg 20
- PT 29(INR=3)
- WBC differential: Neutrophils 74, lymphs 52, monos 5.4, eos 0.12
- ABGs: pH 7.37, Po2 55, Pco2 49
- Gram stain of sputum sample was unsuitable due to numerous squamous epithelial cells
- Urinalysis: WNL

P: Discontinue fluoxetine 20 mg qd in AM or at noon. Continue desipramine. Begin oxygen 2 liters/minute via nasal prongs. Begin ampicillin 500 mg po qid.

NEURO: Oriented x 3, WNL

PROBLEM 2. DRUG ALLERGY

A: K.H. has developed a rash due to the doxycycline started 9 days ago. The usual drug rash is maculopapular and commonly occurs after 7-10 days of therapy. Avoid antihistamines unless K.H. is itching, because they are sedating and have anticholinergic effects.

O: K.H. has maculopapular rash on trunk and thighs, his eosinophiles are 1.2.

P: Discontinue Vibramycin. Aveeno baths for a soothing effect may be needed. Label K.H. allergic to doxycycline. Monitor for resolution of the rash. Educate patient that he has an allergy to doxycycline and possibly other tetracyclines.

PROBLEM 3. DEPRESSION

A: K.H. has had his current complaints for more than a month. While he does not appear to be suicidal at this point, he needs treatment. Fluoxetine is as effective, has less side effects, and, when all costs are taken into account, is no more expensive to use than older tricyclic antidepressants such as imipramine and desipramine.

O: None.

P: Begin fluoxetine 20 mg qd in AM or at noon. Continue therapy for 6 months.

PROBLEM 4. DEEP VEIN THROMBOSIS

S: No complaints

O: The measurements of INR have shown wide swings over the last seven months. Presently the INR has stabilized around 3.0 for the last two months.

A: Since the patient had only one occurrence of deep vein thrombosis, warfarin therapy is usually discontinued after six months of prophylactic treatment.

P: Discontinue warfarin.