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Medical communications and information design

Keywords: pharmaceuticals, medicine, printed communications, typography

An organization of pharmacists requested our services to improve the design of their printed communications to medical doctors, concerning the use of pharmaceutical drugs. Departing from a design process model developed by the Communication Research Institute of Australia, we selected an existing document, interviewed users, defined the objectives of the document, established performance benchmarks, produced a new prototype, and tested it. Results indicated that memory of the contents had improved in accuracy, and that the time required for search-and-find tasks had been substantially cut. The article describes the process followed and outlines future research to be undertaken.

The present article could be defined as a case study. As such, it is a testimony of action. However, we rather prefer to present it as the adaptation of an existing methodological model, since we found the process quite effective in allowing us to advance through the project with clarity and efficiency, and arrive at a good final result. Of course the final result relied substantially on pre-existing knowledge related to perception, cognition and typography, but the method provided a clear signposting for the steps to be followed. The space available here does not allow us to discuss the relevant literature that supports the thirty-nine design recommendations made to the client, some of which led to the second prototype developed. In the original report to the client this took 30 pages. We have, however, included the references that we used as an indication of most of the sources consulted.

Late in 2004, we undertook the evaluation and redesign of a document of the Alberta Drug Utilization Program (called in Canada an Academic Detailing Sheet) produced to inform general practitioners about pharmaceutical drugs and their use in different situations. This document is a double sided, laminated, lettersize sheet (similar to an ISO A4). Its topic is Chronic Obstructive Pulmonary Disease (COPD).

The design process was based on a procedure developed by the Communication Research Institute of Australia (CRIA). This procedure involves seven stages: (1) Scoping: identifying all the users of a given document with a view to obtaining information from them about the document in question, that is, about the actual use of the document and the physical, perceptual and cognitive tasks that its use involves. This allows the designers to identify and define the actual functioning of a given document, and develop performance specifications. (2) Benchmarking: establishing the degree to which the objectives of the document are being met. (3) Designing: producing
SUMMARY OF CANADIAN THORACIC SOCIETY COPD GUIDELINES

Chronic obstructive pulmonary disease (COPD) is a respiratory disorder largely caused by smoking. It is characterized by progressive, partially reversible airway obstruction, systemic manifestations, and increasing frequency and severity of exacerbations.

Smoking cessation is the single most effective intervention to reduce the risk of developing COPD and the only intervention that has been shown to slow its progression.

Diagnosis

A postbronchodilator forced expiratory volume in 1 sec (FEV₁) of less than 80% of the predicted normal value and a ratio of FEV₁ to forced vital capacity (FVC) of less than 0.70 are both required for COPD to be diagnosed.

Most patients with COPD are not diagnosed until the disease is well advanced. Spirometry targeted at individuals who are at risk for COPD can establish an early diagnosis.

Who Should Undergo Spirometry Testing to Detect COPD: A Decision Support

- Smokers or ex-smokers 40 years of age and older
- Individuals with persistent cough and sputum production, with frequent respiratory tract infections, or with progressive activity-related shortness of breath.

Evaluation of the COPD Patient

Figure 1 shows a functional scale that is useful to assess shortness of breath and disability, and can assist in the evaluation of disease severity (Table 1).

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Breathless with strenuous exercise</td>
</tr>
<tr>
<td>2</td>
<td>Short of breath when hurrying on the level or walking up a slight hill</td>
</tr>
<tr>
<td>3</td>
<td>Walks slower than people of the same age on the level or stops for breath while walking at own pace on the level</td>
</tr>
<tr>
<td>4</td>
<td>Stops for breath after walking 100 yds</td>
</tr>
<tr>
<td>5</td>
<td>Too breathless to leave the house or breathless when dressing</td>
</tr>
</tbody>
</table>

Physical examination and chest x-rays are not usually diagnostic but are helpful to rule out comorbidities and complicating diseases. Arterial blood gases should be considered in patients with an FEV₁ < 40% predicted.

COPD and asthma are fundamentally different and this diagnostic distinction should be made.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>At risk (does not yet fulfill diagnosis)</td>
<td>Asymptomatic smoker, ex-smoker or chronic cough, sputum, but postbronchodilator FEV₁/FVC ≥ 0.7 and/or FEV₁ ≥ 80% of predicted</td>
</tr>
<tr>
<td>Mild</td>
<td>Shortness of breath for COPD when hurrying on the level or walking up a slight hill. FEV₁/FVC &lt; 0.7 and/or FEV₁ 60% to 79% predicted</td>
</tr>
<tr>
<td>Moderate</td>
<td>Shortness of breath causing patient to walk slower than people of same age on the level or stop after walking about 100 meters (or after a few minutes) on the level. FEV₁/FVC &lt; 0.7 and/or FEV₁ 40% to 59% predicted</td>
</tr>
<tr>
<td>Severe</td>
<td>Shortness of breath resulting in the patient too breathless to leave the house or breathless after dressing/undressing or the presence of chronic respiratory failure or clinical signs of heart failure. FEV₁/FVC &lt; 0.7 and/or FEV₁ &lt; 40% predicted</td>
</tr>
</tbody>
</table>

COPD patients tend to have later age onset, a significant smoking history and slowly progressive symptoms over years. Patients with COPD never normalize their lung function.

Consider referral to a specialist when:

- Diagnosis is uncertain
- Symptoms are severe or disproportionate relative to the severity of air flow obstruction on spirometry
- Onset of symptoms is at a younger age (< 40 years).

Specialists can assist with the management of COPD patients who fail to respond to combined bronchodilator therapy, have severe or recurrent exacerbations, have complex comorbidities, require pulmonary rehabilitation, require assessment for home oxygen or may be candidates for surgical therapies.

For complete guideline refer to: Can Respir J. 2003 May-Jun;10 Suppl A:A14-A65A

Figure 1a. Summary of Canadian Thoracic Society COPD Guidelines: Alberta Drug Utilization Program (front)
Management of COPD

Bronchodilators are the mainstay of COPD pharmacotherapy. They can reduce air trapping (lung overinflation) and dyspnea, and improve quality of life even if there is no improvement in spirometry.

**Figure 2: Escalating Management Paradigm for COPD**

A: Management of COPD (Ideal)  
- Inhaled Steroids  
- Rehabilitation  
- Long-Acting Bronchodilators  
- Short-Acting Bronchodilators  
- Education/Self Management  
- ↓ FEV₁ → ↑ Dyspnea  
- Early Diagnosis (spirometry) → prevention  
- Rx AECOPD → Follow-up → End of Life Care

B: Management of COPD (Current)  
- Inhaled Steroids  
- Rehabilitation  
- Long-Acting Bronchodilators  
- Short-Acting Bronchodilators  
- Education/Self Management  
- ↓ FEV₁ → ↑ Dyspnea  
- Early Diagnosis (spirometry) → prevention  
- Rx AECOPD → Follow-up → End of Life Care

**Figure 3: Pharmacotherapy in COPD**

- **mild**: SABA pm  
  - Tiotropium or LABA + SABA pm  
  - Tiotropium + LABA + SABA pm

- **moderate**:  
  - Tiotropium + LABA (+ theophylline) + SABA pm

- **severe**:  
  - Tiotropium + LABA + ICS + theophylline + SABA pm

Note: SABA: short-acting bronchodilator (beta, agonists or anticholinergics); LABA: long-acting beta-agonist (ie, formoterol or salmeterol); SABA: short-acting beta-agonist. To prevent exacerbation of COPD an annual influenza vaccine is recommended and a pneumococcal vaccine should be given at least once, and possibly every 5 to 10 years.

Acute Exacerbations of COPD

AECOPD is defined as a sustained worsening of dyspnea, cough or sputum production leading to an increase in the use of maintenance medications and or supplementation with additional medications. AECOPD is further classified as either purulent or non-purulent. Antibiotics should only be considered in patients with purulent AECOPD.

History, physical exam and chest x-rays are recommended for patients with AECOPD. Sputum Gram stain and culture should be considered for patients with very poor lung function, those with frequent exacerbations or those who have been on antibiotics in the previous 3 months. Spirometry should be completed in patients suspected of having COPD only after recovery and stable.

Combination therapy with short acting beta-agonists and anticholinergic bronchodilators should be used to treat dyspnea in AECOPD. Patients already on oral methylxanthines may continue, but there is no role for the new initiation of therapy.

Oral or intravenous steroids should be administered for 14 days in most moderate to severe COPD patients with AECOPD: however, shorter treatment periods of between 7 and 14 days may also be effective. Doses equivalent to 25 - 50mg of prednisone per day are recommended.

| Simple COPD without risk factors | Increased cough & sputum production & increased dyspnea  
| Complicated COPD with risk factors | As above PLUS at least 1 of FEV₁ ≤ 50%, 2 or 3 exacerbations/year, ischemic heart disease, use of home oxygen, chronic oral steroid use, antibiotics in past 3 months |

**Table 2: Antibiotic Treatment for Purulent AECOPD**

1st Line: Amoxicillin, doxycycline, trimethoprim/sulfamethoxazole, 2nd or 3rd generation cephalosporins, extended spectrum macrolides.

Alternatives: Betalactam/beta-lactamase inhibitor, fluoroquinolone.

1st Line: Beta-lactam/beta-lactamase inhibitor, fluoroquinolone.

Alternatives: May need parenteral therapy, consider referral.

In severe AECOPD complicated by acute respiratory failure not responsive to initial bronchodilator therapy, ventilatory support may be indicated and beneficial. Consultation with a COPD specialist is recommended in this setting.
a first prototype that attempts to improve the existing performance. (4) Testing: evaluating the degree to which the objectives of the document are better met by the new prototype. (5) Refining: producing changes to the prototype based on the information obtained through testing. Steps 4 and 5 might be repeated several times.

Figure 2a. CRIA's design process diagram

The procedure involves two other steps, but they were not part of our project. Step 6 is implementing, that is, the actual production and use of the newly designed document. Step 7 involves monitoring the performance of the new document by means of measures taken after actual implementation. This step leads back to scoping and benchmarking, and results eventually in a newly upgraded design. While the procedure is not unique, the simplicity of its enunciation deserves credit.

In actual fact, we modified the process somewhat because time frames and availability of users forced us to collapse two aspects: the testing of the existing document and that of the new one. This modification constitutes one of the two methodological adjustments we made in this project. The other adjustment, discussed further below, involved accommodating the fact that for the detailing sheets there was no pre-existing set of performance criteria, which made it necessary to create a reasonable set of these as part of our scoping activities.

The actual process we followed involved the following steps:

1) Scoping: through telephone and personal interviews with users and producers we defined the objectives for the academic detailing sheets and, on that basis, we developed performance specifications and wrote a preliminary report to the client. Each step was followed by a discussion with the client (see Figure 3).

2) Designing: development of a new prototype on the basis of the information obtained (see Figure 4).

3) Testing and benchmarking: evaluation of the degree to which the existing sheet and the new prototype met their objectives and supported the tasks of the users. This was done on the basis of interviews with users.

4) Refining: Analysis of interview responses and production of new prototype 2 (see Figure 5).

5) Writing the final report.

Figure 2b. The diagram of the process we followed. The project did not arrive at the implementation stage, therefore CRIA’s steps 6 and 7 are not included

Scoping

The first step of the project involved the task of Scoping, that is, developing product performance specifications. The aim was to define a list of functions that the product was expected to perform. The list of performance specifications developed was based on interviewing three family doctors from Alberta, and five academic detailing
### General Practitioner 1

**Form and format**
- Very busy. Could it be smaller?
- With easy access to info (not like the AMA binder).
- The PDA is a good option.

**Content**
- Very comprehensive.
- Both general and specific.
- Good narrative form.

**Function**
- Consultation in case of acute exacerbation

**Frequency of use**
- Filed with other not frequently used things. Once every week or two. It would be more accessible if it were PDA

### GP. 2

**Form and format**
- Lamination good: a keeper
- PDA popular but I do not use it.

**Content**
- Well organized. Finer details could be added as a second sheet.

**Function**
- Learning
- Updating
- Confirming practices

**Frequency of use**
- Kept in a coil binder with other frequently consulted things, but consulted rarely. Good value though, because of function (see above)

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### Academic Detailer 1

**Form and format**
- Seems positive. Good practical headings and flow diagrams

**Content**
- Short and concise: details out.
- Interested in specifics of drugs available: dosage, costs, tips. Current form limited use as a reference. In Sask: drug treatment

**Function**
- Quick reference for typical management. Probably general info.

**Frequency of use**
- First with Acad. Detailer, to focus discussion. Then may never consult again.

### Ac Det 2

**Form and format**
- Handy reference. Looks nice. Not the font I'd choose. 2-sided better than stapled. Possibly PDA but not yet a good one. Pocket size could be useful.

**Content**
- Might need to include sources for further information. Drug tables would be a good addition (maybe not as extensive as in Sask)
- A summary at the end would be useful. Also listing authors. Lacks detail, like dosage, but it could become too cramped.

**Function**
- Reference to a particular patient.
- Quick reference. Memory aid.

**Frequency of use**
- Quick reference when seeing a patient.

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**Figure 3.** Summary of the interviews with academic detailers and general practitioner
Client 1 (Academic Detailer)
Branding is a factor. Too many things. I’d like one side text, one side diagrams. Always one page. It is not user-friendly.

Quick reference
Check-list
Diagnosis aid

Client 2 (Academic Detailer)
Too many words. Needs flow charts
No consistent color-coding in Health
Saskatchewan coil book is good.

Incomplete. Doctors have to refer to other sources.

Quick reference

Ac Det 3
Pretty busy (Also pretty complete). In NS they provide a binder. A three-hole binder could be provided. PDA could be an option.

Pretty complete. It would take a lot of time to go through it. It looks like stuff taken from the guidelines. In NS they cite areas of uncertainty – questions to consider. It might include a section to show patients. Figure 2 in part B could be removed.

When with a patient to check severity of condition. Or once the results are back from the lab. Also to check next step in a sequence.

Ready reference. Not so consulted after a while. Depends on the kinds of patient the doctors see.

GP.3
Quite concise. Lots of diagrams and tables: good. Easy to look at. Kept in a binder in the office. Some at home in a computer. The arrangement is good. Not difficult to find stuff. More color might be useful. He would like to have it in PDA.

The brevity is good. If they were longer he would just go to the guidelines. A good summary.

To find out anything I'm unsure of. Not all at once, but back to it repeatedly as circumstances warrant.

It would be useful to have this material to take for group discussions with reference to specific cases.

Consults once or twice a month, depending on the material.
Chronic obstructive pulmonary disease (COPD) is a respiratory disorder largely caused by smoking. It is characterized by progressive, partially reversible airway obstruction, systemic manifestations, and increasing frequency and severity of exacerbations.

Smoking cessation is the single most effective intervention to reduce the risk of developing COPD and the only intervention that has been shown to slow down its progression.

1 Diagnosis

Required conditions
A postbronchodilator forced expiratory volume in 1 second (FEV1) of less than 80% of the predicted normal value and a ratio of FEV1 to forced vital capacity (FVC) of less than 0.70.

Early diagnosis
Most patients with COPD are not diagnosed until the disease is well advanced. Spirometry targeted at individuals who are at risk for COPD can establish an early diagnosis.

Who should undergo spirometry testing to detect COPD
- Smokers or ex-smokers 40 years of age and older.
- Individuals with persistent cough and sputum production, with frequent respiratory tract infections, or with progressive activity-related shortness of breath.

2 Evaluation of the COPD Patient

The Medical Research Council Dyspnea Scale is useful to assess shortness of breath and disability, and can assist in the evaluation of disease severity.

Assessing disability in COPD (Dyspnea scale)

- Grade 1 (none) Breathless with strenuous exercise.
- Grade 2 Short of breath when hurrying on the level or walking up a slight hill.
- Grade 3 Walks slower than people of the same age on the level or stops for breath while walking at own pace on the level.
- Grade 4 Stops for breath after walking 100 yds.
- Grade 5 (severe) Too breathless to leave the house or breathless when dressing.

Classification of disease severity

COPD Stage | Symptoms
--- | ---
At risk (does not yet fulfill diagnosis) | Asymptomatic smoker, ex-smoker or chronic cough/sputum, but postbronchodilator FEV1/FVC ≥ 0.7 and/or FEV1 > 80% predicted
Mild | Shortness of breath for COPD when hurrying on the level or walking up a slight hill. FEV1/FVC < 0.7 and/or FEV1 60% to 79% predicted
Moderate | Shortness of breath causing patient to walk slower than people of same age on the level or stop after walking about 100 meters (or after a few minutes) on the level. FEV1/FVC < 0.7 and/or FEV1 < 40% to 59% predicted
Severe | Shortness of breath resulting in the patient too breathless to leave the house or breathless after dressing/undressing or the presence of chronic respiratory failure or clinical signs of heart failure. FEV1/FVC < 0.7 and/or FEV1 < 40% predicted

Physical examination and chest x-rays are not usually diagnostic but are helpful to rule out comorbidities and complicating diseases. Arterial blood gases should be considered in patients with an FEV1 < 40% predicted.

COPD and asthma are fundamentally different and this diagnostic distinction should be made.

COPD patients tend to have:
- Later age onset,
- A significant smoking history, and
- Slowly progressive symptoms over years.

Patients with COPD never normalize their lung function.

Consider referral to a specialist when:
- Diagnosis is uncertain
- Symptoms are severe or disproportionate relative to the severity of airflow obstruction on spirometry
- Onset of symptoms is at a younger age (< 40 years)

Specialists can assist with the management of COPD patients who fail to respond to combined bronchodilator therapy, have severe or recurrent exacerbations, have complex comorbidities, require pulmonary rehabilitation, require assessment for home oxygen or may be candidates for surgical therapies.
3 Management of COPD

Bronchodilators are the mainstay of COPD pharmacotherapy. They can reduce air trapping (lung overinflation) and dyspnea, and improve quality of life even if there is no improvement in spirometry.

Pharmacotherapy in COPD

- Mild: SABD prn
- Tiotropium or LABA + SABD prn
- Moderate: Tiotropium + LABA + SABA prn
- Tiotropium + LABA [+] theophylline + SABA prn
- Severe: Tiotropium + LABA/ICS + theophylline + SABA prn

1. Long-term maintenance treatment with oral corticosteroids has no proven benefit in COPD.
2. Inhaled corticosteroids (ICSs) should not be used as a first-line medication but should be considered in patients with moderate to severe COPD who experience three or more acute exacerbations per year, especially if these exacerbations require treatment with oral steroids.
3. Patients who remain breathless despite optimal bronchodilator therapy may benefit from the addition of a combination of ICS/LABA.

Note:
- SABD short-acting bronchodilator (beta2-agonists or anticholinergics);
- LABA long-acting beta2-agonist (ie, formoterol or salmeterol);
- SABA short acting beta2-agonist (ie, salbutamol).

To prevent exacerbation of COPD

An annual influenza vaccine is recommended and a pneumococcal vaccine should be given at least once, and possibly every 5 to 10 years.

4 Acute Exacerbation of COPD

AECOPD is defined as a sustained worsening of dyspnea, cough or sputum production leading to an increase in the use of maintenance medications and/or supplementation with additional medications. AECOPD is classified as purulent or non-purulent. Antibiotics should only be considered in patients with purulent AECOPD.

History, physical exam and chest x-rays are recommended for patients with AECOPD. Sputum Gram stain and culture should be considered for patients with very poor lung function, those with frequent exacerbations or those who have been on antibiotics in the previous 3 months. Spirometry should be completed in patients suspected of having COPD only after recovery and stable.

Combination therapy with short-acting beta2-agonists and anticholinergic bronchodilators should be used to treat dyspnea in AECOPD. Patients already on oral methylxanthine may continue, but there is no role for the new initiation of therapy.

Oral or intravenous steroids should be administered for 14 days in most moderate to severe COPD patients with AECOPD; however, shorter treatment periods of between 7 and 14 days may also be effective. Doses equivalent to 25 - 50 mg of prednisone per day are recommended.

Antibiotic Treatment for Purulent AECOPD

1. Simple (COPD without risk factors)
   - Increased cough and sputum; sputum purulence and increased dyspnea.
   - 1st Line: Amoxicillin, doxycycline, trimethoprim/sulfamethoxazole, 2nd or 3rd generation cephalosporins, extended spectrum macrolides.
   - Alternatives: Beta-lactam/beta-lactamase inhibitor, fluoroquinolone.

2. Complicated (COPD with risk factors)
   - As above PLUS at least 1 of: FEV1 <50% predicted; ≥4 exacerbations/yr; ischemic heart disease; use of home oxygen; chronic oral steroid use; antibiotics in past three months.
   - 1st Line: Beta-lactam/beta-lactamase inhibitor, fluoroquinolone.
   - Alternatives: May need parenteral therapy, consider referral.

In severe AECOPD complicated by acute respiratory failure not responsive to initial bronchodilator therapy, ventilatory support may be indicated and beneficial. Consultation with a COPD specialist is recommended in this setting.

Figure 4b. New Prototype 1 (back)
Figure 5a. New prototype 2 (front). One of the changes to this prototype is the lightening of the inserts’ background from 25% to 15% of the blue used for these sheets. This does not show clearly in the black and white printing of this reproduction, but allows the backgrounds for the subtitles to be more conspicuous, keeping visual hierarchies where they should be.
### 3 Management of COPD

**Bronchodilators** are the mainstay of COPD pharmacotherapy. They can reduce air trapping (lung overinflation) and dyspnea, and improve quality of life even if there is no improvement in spirometry.

#### Pharmacotherapy in COPD

- **Mild**
  - SABD pm
  - Tiotropium or LABA + SABD pm

- **Moderate**
  - Tiotropium + LABA + SABA pm
  - Tiotropium + LABA [+ theophylline] + SABA pm

- **Severe**
  - Tiotropium + LABA/ICS [+ theophylline] + SABA pm

1. Long term maintenance treatment with oral corticosteroids has no proven benefit in COPD.
2. Inhaled corticosteroids (ICSs) should not be used as a first-line medication but should be considered in patients with moderate to severe COPD who experience three or more acute exacerbations per year, especially if these exacerbations require treatment with oral steroids.
3. Patients who remain breathless despite optimal bronchodilator therapy may benefit from the addition of a combination of ICS/LABA.

**Note**
- SABD short-acting bronchodilator (beta2 agonists or anticholinergics);
- LABA long-acting beta2 agonist (ie, formoterol or salmeterol);
- SABA short acting beta2 agonist (ie, salbutamol).

To prevent exacerbation of COPD

An annual influenza vaccine is recommended and a pneumococcal vaccine should be given at least once, and possibly every 5 to 10 years.

### 4 Acute Exacerbation of COPD

**AECOPD** is defined as a sustained worsening of dyspnea, cough or sputum production leading to an increase in the use of maintenance medications and/or supplementation with additional medications. AECOPD is classified as purulent or non-purulent. **Antibiotics** should only be considered in patients with purulent AECOPD.

History, physical exam and chest x-rays are recommended for patients with AECOPD. **Sputum Gram stain and culture** should be considered for patients with very poor lung function, those with frequent exacerbations or those who have been on antibiotics in the previous 3 months. Spirometry should be completed in patients suspected of having COPD only after recovery and stable.

Combination therapy with short acting **beta2-agonists** and **anticholinergic bronchodilators** should be used to treat dyspnea in AECOPD. Patients already on oral methylxanthine may continue, but there is no role for the new initiation of therapy.

**Oral or intravenous steroids** should be administered for 14 days in most moderate to severe COPD patients with AECOPD; however, shorter treatment periods of between 7 and 14 days may also be effective. Doses equivalent to 25 - 50 mg of prednisone per day are recommended.

#### Antibiotic Treatment for Purulent AECOPD

1. **Simple** (COPD without risk factors)
   - **Increased cough and sputum, sputum purulence, and increased dyspnea.**
     - **1st Line:** Amoxicillin, doxycycline, trimethoprim/sulfamethoxazole, 2nd or 3rd generation cephalosporins, extended spectrum macrolides.
     - **Alternatives:** Beta-lactam/beta-lactamase inhibitor, fluoroquinolone.

2. **Complicated** (COPD with risk factors)
   - As above PLUS at least 1 of: FEV1 <50% predicted; >4 exacerbations/yr; ischemic heart disease; use of home oxygen; chronic oral steroid use; antibiotics in past three months.
     - **1st Line:** Beta-lactam/beta-lactamase inhibitor, fluoroquinolone.
     - **Alternatives:** May need parenteral therapy, consider referral.

**In severe AECOPD** complicated by acute respiratory failure not responsive to initial bronchodilator therapy, ventilatory support may be indicated and beneficial. Consultation with a COPD specialist is recommended in this setting.

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**Figure 5b.** New prototype 2 (back).
professionals (that is, the people that develop and administer these documents): one from Saskatchewan, one from British Columbia, one from Nova Scotia, and two from Alberta. The interviews were in some cases carried out in person and in other cases by phone, and each one lasted about twenty minutes.

During the scoping phase, we became aware of the difficulties involved in applying the CRIA procedure in cases where the functions of the document are not well defined. Typical applications of the procedure involve developing a comprehensive list of the functions that have been determined through reviewing organizational policies, and in some cases legislative requirements (Sless 1997, 2003a). These functions are then reviewed by an advisory panel consisting of representatives of each stakeholder group. In our case, the list of functions had to be defined without reference to existing materials of this kind, and our advisory panel therefore helped in the formulation of the list rather than in its review. We were also unable to include representatives of all stakeholder groups. We had doctors from one province and academic detailers from five provinces, but not the writers of the clinical best practice guidelines, representatives of the pharmaceutical industry, or patients.

To collect as wide a range of functions as possible, we prepared a set of questions. The format varied slightly, depending on whether we were speaking with doctors or administrators of the academic detailing sheets, but the substance was the same. Here are the questions we asked the doctors:

1) Could you tell me what do you use them for?
2) Do you tend to use them more to find specific information, or do you use them more to inform yourself in general?
3) Could you tell me why or in which situations you use them?
4) Could you tell me how frequently you use them?
5) Do you ever use them as quick reference material, as a sort of memory aid?
6) Would there be a better way of arranging the information so that it becomes more efficient for you, in other words, would there be a better way to help you find what you look for in a sheet?
7) Would there be additional information that you would like to find there?
8) Is there unnecessary information that should be deleted?
9) How do you store these sheets? Is it easy for you to locate the one sheet you are looking for when you need one?

We are trying to define the functions that the sheets perform, and improve the service they provide. Is there anything else you want to add?”

Summary of responses to the existing COPD sheet (Figure 1)

Four headings were used to group the responses: Form and format; Content; Function; and Frequency of use. The responses can be summarized as follows:

1. Form and format
Several subjects found the sheet very busy. Small size was an asset, and users wanted easy access to information. One subject said that pocket size could be useful. Some indicated that a PDA would be a good option, but others said they never use it, and one said there is not a good one so far. Lamination is good for durability, but some complained about glare, and suggested that a two-sided sheet is better than stapled pages. It was proposed that one side should be text and the other, diagrams. The current design was not found user-friendly. Apparently
not having an agreement about color coding in Canada is a problem, but more color could be useful. A three-hole binder might help organize the materials.

2. Content
Users saw the content as very comprehensive, concise and well organized, and offered several suggestions. If there was a second sheet, it could have more details, since the information is incomplete and doctors needed to go to other sources for detailed information. It would be desirable to include something else about dosage, costs, and tips. A solution could be to include lists of sources for further information. Drug tables could be useful. The document could include a section to show patients. It was stated that Figure 2 in Part B could be removed from the existing document. Several interviewees praised its brevity: if it were longer, one subject said he would just go to the Alberta Medical Association (AMA) Guidelines.

3. Function
Subjects found the instrument a source of general information about a particular disease and the related drugs. They used it for learning, updating and confirming practices. They also used the document for quick reference in cases of acute exacerbation. Functions identified were: quick reference, check list, typical management, diagnosis aid, and memory aid. Often the document was consulted in reference to a particular patient, sometimes to check a severity of condition or when the results are back from the lab. It was recognized as a good reference for the sequence of steps to follow and to clear uncertainties. A potential use identified was as a resource for group discussions with reference to specific cases.

4. Frequency of use
Doctors first used the document going through it with the Academic Detailer, to focus discussion (Academic Detailers pay personal visits every time a new document is produced). Doctors usually filed the document with other not frequently consulted things. However, most interviewees tended to consult it once every week or two, or once a month. Even though it was not consulted daily, it was found to be of good value. A few doctors suggested that if the content were in a digital format, for use in a Personal Digital Assistant (PDA) it would be more accessible, particularly for quick reference when seeing a patient.

After the interviews we produced a summary of the responses, which we used to identify key emerging issues (Figure 3). All subjects were positive about the sheets. Opinions about the value of turning them into electronic information were diverse. This process of interviews and analysis led to the drafting of a set of performance criteria. We determined that the document supported two main functions:

1) **general review and updating**, when the user sees the sheet for the first time. For this the sheets must offer a content that is easy to grasp and remember, so that future quick reference can be efficient; and

2) **quick reference**, usually when dealing with a specific patient. For this purpose, the sheet should facilitate quick finding, comprehending, and remembering information.

This collection of responses led to identifying two main cognitive tasks to be performed with the sheets: **memorization of the content**, and **fast identification** of key words. Memorization was seen as central to the usefulness of the instrument. If the doctors were unable to memorize the generalities of the content when they read the instrument for the first time, they would not be able to remember that this relevant information might be there when they needed it. Secondly, we realized that for **quick reference** it was necessary to allow doctors to find essential information easily through quick scanning when they were meeting a patient and wanted to confirm something.
Following are the performance criteria we identified. Performance criteria involving *Updating.*
- The document should be easy to comprehend.
  - It should be easy:
    - to find a specific section in a document.
    - to remember its general content.

Performance criteria involving *Quick Reference*
- It should be easy:
  - to identify different degrees of severity of the condition.
  - to find references to diagnostic differences.
  - to find references to pharmacotherapy.

It is clearly a challenge for an instrument like this to serve both functions well. This calls for a more detailed listing of performance specifications and for their interpretation as design criteria.

**Design: developing the new prototype**

On the basis of the performance specifications developed, we produced a new prototype. Changes introduced to the design of the new prototype related to information sequence, information chunking, hierarchies, visual strategies to denote hierarchies, memory aids, and details of tone, color, font, and size of type. The following performance specification list was developed at a higher level of detail to guide the redesign of the instrument:

1. It should be easy to store the sheet.
2. It should be easy to find a sheet in a group of similar materials.
3. It should be easy to identify the topic of the sheet.
4. It should be easy to follow the intended sequence of the text.
5. It should be easy to read all texts.
6. It should be easy to find a specific section in the text.
7. It should be easy to identify different degrees of severity where they exist.
8. It should be easy to find references to drugs.
9. It should be easy to remember the contents of the sheet.

Design responses to these requirements as shown in the new prototypes (See Figures 4 and 5)

1. *It should be easy to store the sheet*
   - The sheet is lettersize, laminated, and comes with three holes for optional storage in 3-hole binders. (It is proposed that the sheets be printed on coated matte cover stock or laminated with a matte finishing to facilitate durability and reduce glare).

2. *It should be easy to find a sheet in a group of similar materials*
   - Each topic for an academic detailing sheet will have a distinct color. This color will be based on the color assigned to the corresponding disease in the Alberta Medical Association Guidelines, but a high perceptual performance expectation might require review of existing standards.

3. *It should be easy to identify the topic of the sheet*
   - The main topic of the sheet is conspicuously set at the top of the front page, and on the outer edge of the front and back of the sheet, reversed out in white against the color used for the particular sheet.
   - The main titles for the whole sheet and main sections of the new prototype are white, reversed out from an 80% tint of the main color. All colors for the system of sheets are dark, so that white type will read well even in an 80% tint. The inserts are a 25% tint of the same color so that black type can be read well (In prototype 2 the tint was reduced to 15% to avoid competing in contrast with the visual attraction of subtitles and with the use of color as a code for degrees of severity). A color bar at the top and on the outer edge of the sheet facilitates finding a specific sheet.
4. It should be easy to follow the intended sequence of the text
The reading sequence has been consistently arranged in two columns. Section titles have been numbered and made conspicuous through the use of white lettering on color ground, avoiding the tonal difficulties of the existing version, and facilitating recall of number of sections in one sheet. This is also intended to facilitate reference. A vertical line has been added in prototype 2 to separate columns from one another.

5. It should be easy to read all texts
Consistent line lengths of a capacity for approximately ten words fall well within ideal readability ranges, avoiding the excessive line length of the existing version. Type shows consistent high contrast with the ground, avoiding the printing of type in color with low contrast, which creates reading difficulties.

Choice of font and use of type: the font chosen is the *Sans* variety of *Thesis* by Luc(as) de Groot, designed in 1994. This type includes eight different weights and is characterized by its consistent stroke thickness, which facilitates use in small sizes without affecting the perception of individual elements of a letter. It also has well resolved endings, preventing confusion between similar letters. The wide set of variables of the font allowed us to use the extra-bold, to conspicuously highlight keywords within the text. The old-style numbers however – with their variable height and base line – led us to avoid their use for mathematical equations. For that purpose we used Trebuchet, designed in 1996 by Vincent Connare for Microsoft.

The selection and use of fonts, and the choice of sizes, styles and tonal values, responded to the need to clearly distinguish levels of importance and units of meaning. Layout decisions such as line length, line separation, indents and other formatting strategies supported the typographic decisions. White spaces between typographic elements and in margins were used to facilitate integration and segregation of units of information. A white hairline separating different areas of color maintains the rectangular simplicity of each area and helps separate each unit of information.

Text editing: the layout attempts to keep units of meaning together, avoiding awkward breaks of sentences and words. We have also avoided leaving the first or last line of a paragraph in a different page or column. Hyphenation is used at a minimum.

6. It should be easy to find a specific section in the text
Subtitles have been emphasized through size and typographic weight, facilitating signposting within the text. Emphasis on key words helps finding specific components in the texts.

7. It should be easy to identify different degrees of severity where they exist
Color coding: A scale caution/warning/danger (yellow/orange/red) associated with the notions of severity of the disease, and based on ISO standards for color coding for safety signs, has been used to activate the visual aspect of the sheets and to call attention to levels of severity in a consistent way.

8. It should be easy to find references to drugs
Important content in the text has been highlighted in extra-bold face, to facilitate finding specific references to drugs or conditions.

9. It should be easy to remember the contents of the sheet
It is hoped that the clearer identification of sections, the addition of numbers to their titles, the clearer information chunking, the use of a branding color for each topic, the consistent standardization of type sizes and weights, and the formal consistency of the layout will help users recall the structure of the sheet, and therefore its content.
Benchmarking: measuring the performance of an existing document and of a new design
(Figures 1 and 4)

The second step of the project took place after the interviews were completed and the performance specifications were articulated. Given the tightness of the time-frame and the difficulties we experienced in securing subjects to interview, we decided to alter the sequence proposed by the CRIA and test both the existing version and the new version against the performance specifications at the same time. This new version was developed to support the required performance identified at the scoping stage, on the basis of general typographic and graphic design principles supported by research on perception and cognition.

Once we defined what the instrument was expected to do, we aimed at measuring the degree to which the performance of an existing version and of a new version met the functions identified. We interviewed in person six general practitioners in the province of Alberta. This number was partly based on the experience of the CRIA with interviews of this kind, where it is reported that the amount of information obtained in each interview visibly declines after the sixth subject (Sless 2003b). Meeting the subjects required coordinating times and traveling, given that the region involved in this program is in the province, away from the city of Edmonton. The project was designed to explore the potential of a given method, rather than to arrive at statistically valid conclusions. We therefore believed that six subjects were sufficient for our needs. We designed specific tasks for this purpose and developed scales that provided us quantitative and qualitative indicators of the quality of the products in relation to the performance specifications defined at the scoping stage. We also asked general questions of a qualitative nature regarding ease of use and other related issues.

All individuals tested saw the two versions. To avoid possible sequential order effects, three of them saw one first, three the other. Before beginning with the questions, all individuals were given one minute to familiarize or re-familiarize themselves with the sheets. They were all users of the existing instruments and were familiar with their use.

Assessing the documents’ performance: questions and tasks

The questionnaire contained one or two questions related to each of the criteria we had previously identified. The questionnaire was divided into three parts, dealing respectively with testing one of the two versions of the document, testing the other version, and obtaining general impressions about both documents. It was necessary to avoid asking identical benchmarking questions for both documents, since participants would simply remember their answers for the previous document. We therefore drafted different questions that were intended to be of similar difficulty across the two documents. The text of the questionnaire is in Appendix 1.

Summary of responses

Interviewed subjects in general found both designs easy to read. Some indicated that the existing design was too busy, and that the colors should be in harmony with those used by the AMA Guidelines. All agreed that the new design is more readable, less busy, and has a better use of color. One person indicated he preferred to read across the page (but in the end favored the new design). Black type on white ground was found easier to read than the color variations found in the existing document. The color in the existing sheet was found “boring.” According to the subjects, the white titles in the new sheet stand out better. Several subjects indicated that more copies would be useful, to keep one in each office, also to give to students and interns.
The following items were suggested as useful: a tab at the edge, color highlights, color coding, references to the AMA Guidelines, drug dosages, and a periodically updated index. Lamination was praised but some complained about glare. It was mentioned that abbreviations for drug names could be a problem.

The average time required to complete all search tasks was shorter when using the new design (77 seconds) than when using the existing one (139 seconds).

When attempting to recall the number of sections in the sheet, no subject was able to do this with the existing design, and all subjects were able with the new prototype.

When attempting to remember the titles of the sections, no subject was able to do so completely, but a higher accuracy was possible with the new design.

Subjects in general found the new design easier to read, and performed faster at search tasks. They also supported the color coding, the color palette, and the colors used for type.

On a scale of 1 to 5, 1 being not easy to use and 5 being easy to use, the existing sheet was assigned an average of 3.3, and the new one 4.75.

Feedback: changes introduced to the prototype as a result of testing
(Figure 5)

Given a comment about the need for clarity of content separation between the two columns, Prototype 2 shows an increased space between columns, and introduced a vertical line to mark the separation. In response to confusion of hierarchies observed in one subject between the titles for sections and the titles for inserts, the background tone of inserts was reduced from 25% to 15%, thus allowing the section titles to stand out more visibly. This also favors the perception of color coding for degrees of severity.

Final recommendations

Further to the reported summaries, and to general comments issued by the fourteen people interviewed, nine general recommendations were proposed to the client, as outlined here below.

1. Maintain the Academic Detailing Sheets program.
2. Provide sufficient copies for doctors to have one in each office. Consult with them for possible copies to interns and students.
3. Adopt the principles used for the design of the Prototype 2.
4. Call on content experts to decide which keywords should be highlighted in each document.
5. Call on content experts and designers to work in teams to decide in what cases the information can be presented in a diagrammatic way.
6. Use non-glare lamination, or print on coated matte cover stock to ensure durability, and add a tab with the main title of each sheet.
7. Issue an index, and revise it periodically.
8. Study the possibility of producing an electronic version for people fond of PDAs.
9. Implement the modifications in the program and monitor its performance, fundamentally checking frequency of use, purpose of use, efficiency, and filing system.

Limitations of this study

Given the required time frame, this study did not include questioning the physical instrument nor its content, except for the elimination of its Figure 2 in the new prototypes. Further analysis of the responses to the interviews and further interviews might allow a more thorough revision of the instrument.

Highlighting of words in the text was not done in consultation with content experts. It would be advisable
to do this for future productions, so that scanning to find
something (in the context of the quick reference func-
tion) could be performed efficiently.

**Future research**

We envisage that to achieve maximum performance of an instrument of this kind, it will be necessary to engage in two or three iterations, and to involve at least twice the number of users for interviews and testing. We developed this study as the shortest possible process that will allow the client group to see how the method works. We believe that, although it is not a large-scale study, results are highly reliable and will quite likely be confirmed by future assessments. It is possible, however, that future interviews with users might produce new insights. The development of an actual usable document will require the creation of a team of content experts and information designers, working together, from the definition of content through to the final visual production. This will require user involvement across all stages.

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**References**


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Stan Ruecker is an Assistant Professor of Humanities Computing in the Department of English and Film Studies at the University of Alberta. He is a graduate of the University of Regina (BA Honors English 1985, BSc Computer Science 1988), the University of Toronto (MA English 1989), and the University of Alberta (MDes 1999, PhD 2003). His PhD research was on the affordances of prospect for computer interfaces to large, interpretively-tagged text collections. His postdoctoral research dealt with browsing interfaces for electronic documents. His current research interests are in the areas of computer-human interfaces, text visualization, and information design.

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Appendix 1. Questions and tests to assess document performance

Framing and Confidentiality
Thank you for agreeing to help us.
We are Jorge Frascara and Stan Ruecker.
We are information designers, working on a research project with the Academic Detailing Program.

We are trying to find out how easy or difficult it is to understand the information on the academic detailing sheets.

All the answers you give us will be treated confidentially. We will not pass on names or personal information – only the results from our research.

We are mainly interested in what is wrong with the sheets that we are going to show you, so that we can help to improve them. So, any comments you make will be valuable. If there is anything that you cannot understand or does not make sense, please let us know. Remember, it's the sheets that we are testing, not you.

In a moment we will show you a sheet and ask you to use it to find and explain some information as well as providing general feedback. Even if you know the answer without looking, we want you to show us where the sheet provides the information.

[The subject is shown the existing or the new design. Figure 1 or Figure 4]

General Updating Tasks
[The document should be easy to comprehend]
1. Do you find it easy to read the text?
2. What is your reaction to the choices of font, text size, line length, and color?
   [It should be easy to find a specific section]
3. Where would you look for information on acute exacerbation?
4. Without looking again at the sheet, can you tell me how many sections are in this document?
5. What are they?

Quick Reference Tasks
[It should be easy to identify different degrees of severity of the condition]
6. Please find a reference to who is at risk for COPD.
7. Please find a reference to how to classify a severe COPD. [It should be easy to find references to diagnostic differences]
8. Please find a reference to asthma.
9. Please find a reference to who should undergo spirometry. [It should be easy to find references to pharmacotherapy.]
10. Please find a reference to Tiotropium.

The subject is shown the alternative design

General Updating Tasks
[The document should be easy to comprehend]
11. Do you find it easy to read the text?
12. What is your reaction to the choices of font, text size, line length, and color?
   [It should be easy to find a specific section]
13. Where would you look for information on management of COPD?

Quick Reference Tasks
[It should be easy to identify different degrees of severity of the condition]
14. Please find a reference to grade 2 COPD.
15. Please find a reference to mild COPD.
   [It should be easy to find references to diagnostic differences]
16. Please find a reference to referral to a specialist.
17. Please find a reference to required conditions to diagnose COPD.
   [It should be easy to find references to pharmacotherapy]
18. Where is a combination of LABA + SABA mentioned?

Final opportunity to comment
19. Is there anything else that you would like to see included on a sheet like this?
20. Do you have any comments about the look and feel of these sheets?
21. Do you have any final comments about this sheet that you would like to pass on to the people who make it?

And finally, on a scale of 1 to 5, 1 being NOT EASY to use and 5 being VERY EASY to use: where would you place the green sheet (existing document) and the blue sheet (new prototype)?