



# The Impact of Combination Pharmaceutical Products on Health System Costs and Outcomes

CHARLES J TURCK, Pharm.D.  
Clinical Coordinator of Drug Information  
Advocate Christ Medical Center  
Oak Lawn, Ill.

LIZA BARBARELLO-ANDREWS, Pharm.D., BCPS  
Clinical Assistant Professor of Pharmacy Practice  
Rutgers, The State University of New Jersey's  
Ernest Mario School of Pharmacy  
Piscataway, NJ.

JOHN M. YORK, Pharm.D.  
Principal & CEO  
Akita Biomedical Consulting  
San Clemente, Calif.

## Introduction

Institutional healthcare costs continue to be an issue faced by healthcare administrators. There are many drivers of persistent expense pressures; capitation and declining reimbursement continue to challenge hospital administrators and their departments to ensure the most efficient use of resources and personnel while minimizing risk exposure.

This discussion will examine the use of combination pharmaceutical products (CPPs) in the institutional setting. Healthcare administrators may consider adopting such products as part of a broader, system-wide approach to improve utilization of healthcare resources that also improve patient safety.



PRODUCT'S GENERIC NAME	% OF ERRORS
Insulin*	3.6
Albuterol	2.7
Morphine*	2.6
Potassium chloride*	2.1
Heparin*	2
Warfarin*	1.5
Furosemide	1.5
Cefazolin	1.5
Acetaminophen	1.3
Vancomycin	1.3
Levofloxacin	1.3
Lorazepam	1.3
Enoxaparin	1.2
Hydrocodone and acetaminophen	1.1
Ipratropium	1.1

**TABLE 1. Medications Most Commonly Implicated in Medication Errors in Health Systems**

\*Includes all dosage forms and formulations

Hicks, RW, Santell, JP, Cousins, DD, and Williams, RL. (2004) MEDMARX 5th Anniversary Data Report: A Chartbook of 2003 Findings and Trends 1999-2003 Rockville, MD : USP Center for the Advancement of Patient Safety. © 2003 USPC Inc. Permission granted.

### Healthcare Expenditures

Institutional costs are always top of mind for healthcare administrators and pose a constant challenge. While non-labor expenditures increased approximately 24 percent in recent years, labor costs are the largest component of healthcare expenditures.<sup>1</sup> Out of a total 44 percent increase in healthcare costs between 2001 and 2003, labor costs accounted for the majority at 38 percent.<sup>1</sup> Avenues where hospitals may use their labor resources most effectively are key in this era of cost sensitivity.

### Pharmaceutical Expenditures: A Broader Look

There are barriers to streamlining resource utility, one of which is a phenomenon best characterized as “silovision,” or a fixation by one department on achieving certain cost savings at the expense of greater cost savings to the overall institution. In fewer places is this compartmentalization clearer than in hospital medication distribution.

No single department accounts for the total cost of medication delivery.<sup>2</sup> While the pharmacy department must assume the cost of medication acquisition and storage, other costs are taken up by other department budgets – such as nursing and respiratory therapy – for administration, monitoring and safety. Several departments are responsible for the medication delivery process as a whole, and cost becomes the sum of all the resources expended when a product or service reaches its end-user.<sup>2,3</sup> However, a drug’s acquisition costs can often trump other savings accrued further down the healthcare pathway during a patient’s stay. It may seem appropriate to blame the pharmacy department; however, departmental priorities often reflect those of the hospital administration. Correction of this narrow focus can only be accomplished when higher level administration adopts a broader, pharmacoeconomic perspective regarding pharmaceuticals and other resources.

Several costs are incurred after a medication is acquired: it must be stored, retrieved by a pharmacy technician, retrieved by the professionals responsible for medication administration, and administered to the patient. Each phase of this process adds to the total cost of medication use. Several hidden costs may only be detected in pharmacoeconomic analyses, such as cost of medication errors and space consumption. When all steps of the distribution process are considered, it becomes clear that acquisition cost is often a small constituent of the total cost.<sup>2</sup>

### The Role of Combination Pharmaceutical Products (CPPs)

Of the several potential solutions aimed at mitigating costs to the health system, CPPs may lower total cost of therapy by facilitating the reorganization of labor resources and avoidance of medication errors. The benefits of CPPs have long been recognized in the outpatient setting in that they improve medication adherence,<sup>4,7</sup> cost effectiveness<sup>2,4-10</sup> and clinical efficacy;<sup>4,6,8,10</sup> some of these benefits may extend to the inpatient setting as well.

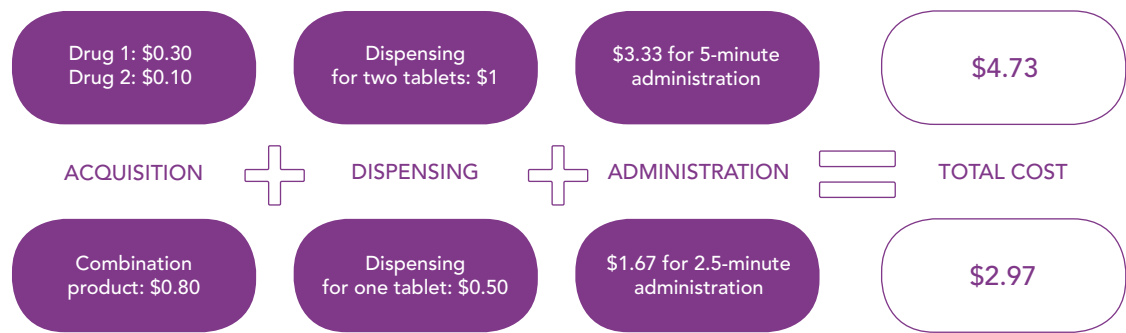


FIGURE 1. Total Cost Model

Reprinted from: Barbarello L, Marsh WM. Economic impact of combination therapies. *Hospital Pharmacy*. 2006;41(Suppl.1):S23-S28. Permission granted Wolters Kluwer Health.

### Labor Cost Impact

One interesting case example involves the use of DuoNeb<sup>®</sup> (Dey, L.P., Napa, Calif.), a combination of albuterol and ipratropium for nebulization in chronic obstructive pulmonary disease (COPD). Use of this combination can present a viable way to decrease respiratory therapist (RT) labor time. The ability to move more quickly from patient to patient eases the burden of the RT's workload. This may decrease the extent that health systems need expensive, contract RTs who are brought in to cover additional workload on an outsourced basis. Nebulized ipratropium is rarely given independently of nebulized albuterol, and a CPP of the two together reduces the chance that an RT will have to return to the patient as it occurs when one of the two medications is missing. Also, nebulized medications should be administered one at a time in a manner consistent with United States Pharmacopeia Chapter <797><sup>11</sup> and Joint Commission on Accreditation of Healthcare Organizations Medication Management standard 4.40,<sup>12</sup> requiring that the RT wait until one medication is fully administered before giving the second, which may take several minutes.

Figure 1 depicts an illustration of how this perspective could affect overall cost. Taking only acquisition cost into account would lead to the erroneous conclusion that total medication cost is cheaper using individual ingredients than CPPs. However, when labor costs are included in the model, the total cost of a CPP is cheaper. Healthcare administrators are encouraged to use a similar, holistic model in determining the overall cost of a healthcare good or service.

Combination albuterol and ipratropium has been documented as improving healthcare outcomes and reducing overall healthcare costs. Chrischilles and colleagues demonstrated that the combination led to a significantly lower risk of emergency department (ED) visits and hospitalizations, shortened length of stay for those requiring admission, significantly lower monthly medication claim charges, and increased compliance.<sup>8</sup> Similarly, York and colleagues established that DuoNeb<sup>®</sup> is associated with fewer ED visits and decreased expenditures as compared to its individual components administered by nebulization.<sup>9</sup>

### Improving Safety

Costs associated with preventable adverse drug events (including medication errors) are estimated at \$5,857 per event, corresponding to an annual cost of \$2.8 million for a 700-bed hospital.<sup>13,14</sup> The labor costs in this figure result from managing the adverse event and monitoring for effects.<sup>13</sup> Although healthcare professionals often equate medication errors with administration of an incorrect drug or dose, *missed or omitted doses* actually occur more frequently. Medication errors may also extend length of stay and increase resource use by prolonging patients' recoveries or aggravating disease states.

CPPs may reduce the risk of medication errors and improve patient safety, which could have an additional indirect effect upon labor costs and resource utilization. Reducing the number of drug doses reduces the risk of medication errors. DuoNeb<sup>®</sup>, in particular, represents an important tool to reduce medication errors; albuterol is the second and ipratropium the fifteenth drugs most commonly implicated in health-system medication errors (Table 1). An illustration of how the two together offer safety advantages over single agents may be found in Table 2. Omission of a medication or order accounts for the most common error when comparing the single- and dual-agent products: albuterol (84 percent), albuterol plus ipratropium (78 percent), and ipratropium (78 percent).<sup>15</sup> These statistics are striking because



TYPE OF ERROR*	ALBUTEROL (N = 19,697)	ALBUTEROL PLUS IPRATROPIUM (N = 4,703)	IPRATROPIUM (N = 7,398)
Omission error	16,521 (84%)	3,694 (78%)	5,751 (78%)
Prescribing error	1,080 (5.5%)	403 (8.6%)	446 (6%)
Improper dose/quantity	661 (3.3%)	163 (3.5%)	239 (3.2%)
Wrong drug	477 (2.4%)	209 (4.4%)	303 (4%)
Wrong time	350 (1.8%)	102 (2.2%)	142 (2%)
Wrong patient	303 (1.5%)	68 (1.4%)	79 (1.1%)
Wrong dosage form	237 (1.2%)	9 (0.2%)	158 (2.1%)
Extra dose	222 (1.1%)	92 (2%)	130 (1.8%)
Drug prepared incorrectly	171 (0.9%)	56 (1.2%)	114 (1.5%)
Wrong administration technique	52 (0.3%)	7 (0.15%)	16 (0.2%)
Wrong route	31 (0.2%)	4 (0.08%)	15 (0.2%)
Expired/deteriorated	8 (0.04%)	1 (0.02%)	5 (0.06%)

TABLE 2. Comparison of Errors with Single Ingredient versus Combination Therapy

\*From January 2001 to December 2004  
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omitting a medication dose could exacerbate COPD, and reducing exacerbations lowers the overall costs associated with COPD management.<sup>16</sup> Additionally, increased workload and insufficient staffing account for 35 percent of errors made;<sup>15</sup> CPPs’ alleviation of workload burden may also reduce medication errors and safety risks.

**New Approach to Consider...**

Continued pressure on health systems to reduce costs in the contemporary healthcare environment necessitates creative ways of maximizing efficient use of resources. Hospital administrators may avoid the barriers imposed by “silo-vision” by embracing a broad assessment of the total cost. CPPs may reduce a medication’s total cost by improving labor efficiency, medication error risk and reducing storage space. By providing a large number of benefits that reduce costs in a variety of ways, CPPs represent a promising future avenue for improving health-system medication delivery challenges.<sup>17</sup>

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