

# If pneumonia is the “old man’s friend”, should it be prevented by vaccination? An ethical analysis

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## Abstract

Because pneumococcal disease is a major problem among the elderly, pneumococcal polysaccharide vaccination is widely promoted. However, Sir William Osler called pneumonia the friend of the aged, leading to an ethical discussion. Mortality from pneumonia is higher with increasing degrees of underlying illness, outweighing the age effect. Although some symptoms are less common in the elderly, other symptoms are not and the duration may be longer. Problematic criteria for limiting pneumococcal polysaccharide vaccination include age, social value, and quality of life. Recommended criteria for limiting vaccination include autonomous patient refusal, imminent death, and lack of medical benefit, as would be seen in hospice cases.

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## 1. Introduction

Pneumococcal disease is a major public health problem in the United States. Consequently, Healthy People 2010 objectives include reducing new invasive pneumococcal infections in adults 65 and older to 7 per 100,000 from the 1997 rate of 9 per 100,000. Other Healthy People 2010 objectives are to increase pneumococcal vaccination rates among non-institutionalized adults aged 65 years and older to 90% and among high risk adults aged 18–64 years to 60% [1].

Despite the benefits of adult vaccination and the availability of usage guidelines, vaccination rates remain low; in 2002, 66% of persons 65 years of age or older reported receiving pneumococcal vaccines, according to the 2002 Behavioral Risk Factor Surveillance System. There was also racial disparity for pneumococcal vaccination rates at 45% for blacks

and 44% for Hispanics. These rates are far short of the Healthy People 2010 goal of 90%.

Because pneumococcal disease is a major problem among the elderly, increasing vaccination rates are important. Therefore, pneumococcal polysaccharide vaccination of the elderly is widely promoted through a variety of legal and administrative mechanisms. In several states, laws require the offering of pneumococcal vaccine. For instance, in 2004 the General Assembly of Pennsylvania enacted a law (Act 86) that all hospitals offer pneumococcal vaccination to the elderly and further requires all other health care facilities to either offer it or provide information on where to obtain vaccination. Other states have mandates to either vaccinate or offer pneumococcal polysaccharide vaccine in long-term care facilities [2].

Due to concerns about low pneumococcal polysaccharide vaccination rates and about antibiotic resistance, the American Medical Association and other professional organizations issued a “Quality Care Alert” about the importance of pneumococcal vaccination. Further, adult vaccination rates have become a measure of quality of care for primary care offices, long-term care facilities, and

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insurance plans. Finally, an October 2002 change in rules by the Centers for Medicare and Medicaid Services, allows standing order protocols for adult vaccination in participating facilities including hospitals and long-term care sites. That is, inpatient facilities may administer vaccines to eligible patients according to an approved protocol, without the need for a separate physician order for each patient.

On the other hand, pneumonia in the elderly, which is often caused by pneumococcal infection, has been viewed with mixed opinions. In his chapter on lobar pneumonia, the quintessential physician and educator, Sir William Osler, wrote ‘Pneumonia may well be called the friend of the aged. Taken off by it an acute, short, not often painless illness, the old man escapes those “cold gradations of decay” so distressing to himself and to his friends.’ [3]. In describing pneumonia, Osler was well aware the pneumonia causes discomfort: “Pain in the side develops often of an agonizing character.” He also knew of its death toll, as he commented that “So fatal is it in this country, at least, that one may say that to die of pneumonia is the natural end of old people.” [3].

Thus, a tension exists between these ideas, namely the use of administrative measures to raise pneumococcal vaccination rates among the elderly and Osler’s assertion that pneumonia is the “friend of the aged.” Of course, Osler wrote in the pre-antibiotic era and at a time when modern respiratory medicines were not available. In this time of limited resources and a burgeoning elderly population, it behooves us to explore some of the ethical issues surrounding medical treatment. The purpose of this article is to review relevant characteristics of pneumococcal polysaccharide vaccine (PPV), the burden of pneumonia in the elderly, and ethical arguments about criteria for PPV use in the elderly.

## 2. Licensed pneumococcal vaccines

Two vaccines are currently licensed against pneumococcus: the older 23-valent polysaccharide vaccine and the 7-valent conjugate vaccine (PCV) licensed in 2000. The vaccine was designed to cover the seven serotypes (4, 6B, 9V, 14, 18C, 19F, and 23F) most common in children. These serotypes account for about 80% of invasive infections in children less than 6 years of age, but only 50% of infections in those aged 6 and older [4]. Among these serotypes, PCV is more immunogenic than PPV, reduces nasopharyngeal carriage of *Streptococcus (S.) pneumoniae* and appears to create herd immunity. In fact, the rates of invasive pneumococcal disease have fallen among adults for the serotypes in PCV, which is given to children, not adults [5]. Because PCV is not licensed for adults, it will not be discussed further.

### 2.1. Pneumococcal polysaccharide vaccine

Pneumococcal polysaccharide vaccine contains 23 polysaccharide antigens that cover 85%–90% of the serotypes of invasive pneumococci in children older than 2

years of age and adults [6]. PPV contains T-independent antigens that stimulate mature B-lymphocytes to produce effective antibody but not T-lymphocytes. Thus, T-independent immune responses do not produce an anamnestic response upon challenge and may not be long lasting. IgM and IgG antibodies can be detected within 5–8 days of vaccination but IgG levels may not peak until 70–100 days after vaccination [7]. Response to vaccination is influenced by genetics.

Most healthy elderly respond to vaccination but about 20% do not [7]. Patients with chronic disease vary in response to PPV: most patients with heart failure, splenectomy and diabetes respond normally whereas those with HIV respond suboptimally and patients with renal failure respond initially but antibody levels decline markedly over 2 years [7].

Following vaccination, serotype-specific antibodies decline after 5–10 years after vaccination [6]. However, in many elderly persons, antibody levels fall after 3–5 years, depending on serotype [7].

### 2.2. PPV vaccine efficacy

In case control studies, PPV has a 56%–81% efficacy in case-controlled studies against invasive pneumococcal disease, with better protection against the serotypes included in the vaccine and in immunocompetent persons [6]. The efficacy of 23-valent PPV against nonbacteremic pneumococcal pneumonia is not known [6]. In a meta-analysis of randomized controlled trials of older pneumococcal polysaccharide vaccines, the efficacy was 66% effective against definitive pneumococcal pneumonia and 83% against definitive pneumococcal pneumonia for vaccine serotypes [8]. Some other investigators have failed to find PPV efficacious against pneumonia.

The vaccine is effective among older children and adults but not in children less than two years of age, because they do not respond well to such antigens. PPV does not reduce nasopharyngeal colonization of *S. pneumoniae*, although the importance of this is debated. Virtually all pneumococcal infections occur in persons who are carriers of *S. pneumoniae* [7].

Following vaccination, serotype-specific antibodies decline after 5–10 years [6]. However, in many elderly persons, antibody levels fall after 3–5 years, depending on serotype [7]. A study of efficacy with time since vaccination did not find a decrease: efficacy was 71% 5–8 years after vaccination compared to 80% efficacy after 9 or more years [9]. This shows that the duration of efficacy is at least 9 years in immunocompetent individuals [10].

Adult vaccination is cost-effective. For persons 65 years of age and older, cost-effectiveness analyses show that pneumococcal vaccination saves \$8.27 per person [11].

### 2.3. PPV adverse reactions

Primary vaccination and revaccination with PPV is extremely safe [12]. About 30%–50% of vaccinees report local

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