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Effect of OMT on Hospital Length of Stay in Elderly Patients with Pneumonia: A Meta-Analysis

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Abstract:

Introduction:

Pneumonia is an infection of the lungs that can be fatal. In elderly the average length of stay for patients over 65 is reported as 5.6 days. Multiple efforts have been made to decrease the length of stay of hospitalized patients to reduce the economic burden as well as improve the overall quality of life for patients. Through a meta-analysis, an analysis of whether OMT can improve outcomes in elderly patients by shortening length of hospital stay.

Methods:

A systematic review was conducted to identify studies which examined the effect of OMT on length of hospital stay in patients with pneumonia, aged 50 years and older, as compared to only receiving conventional care. A meta-analysis, an analysis of the results from the literature search was conducted.

Results:

OMT had a statistically significant decrease in hospital length of stay compared to those undergoing conventional treatment alone ($P = 0.000995$). A statistically significant overall mean difference effect size was -0.301 (Z score = 3.29, $p = 0.001$). Cochran's Q test for heterogeneity supported homogeneity between the studies ($p=0.428$) as did the I^2 of 0%.

Conclusion:

Meta-analysis favored the use of OMT in elderly patients hospitalized with pneumonia to significantly decreased the hospital length of stay compared to those undergoing standardized treatment. Based on these results, OMT should be utilized more in the hospital setting to reduce the length of stay in the hospital and reduced economic burden of days admitted in the hospital.

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Introduction:

There were an estimated 1 million hospitalizations due to pneumonia in 2019[1] (American Thoracic Society), with the average length of stay for patients over 65 being 5.6 days (CDC, 2010).[2] The longer a patient stays in the hospital, the greater the burden of cost and resources are for both the patient and health care centers. Multiple efforts have been made to decrease the length of stay of hospitalized patients to reduce the economic burden as well as improve the overall quality of life for patients. Among the avenues being explored to reduce length of hospital stay is osteopathic manipulative treatment (OMT). OMT, which is a nonpharmacologic technique shown to enhance the body's natural defenses and encourage the body's return to homeostasis, may be useful as an adjunctive therapy to potentially shorten the overall length of stay. In this meta-analysis, we show that the use of OMT as an adjunctive therapy significantly shortens the length of stay in elderly patients hospitalized with pneumonia.

Methods:

A literature search and review were completed using the PubMed database. Selection criteria included studies from 1999 to 2020, the use of OMT in patients hospitalized with pneumonia, subjects aged 50 and older, and documented length

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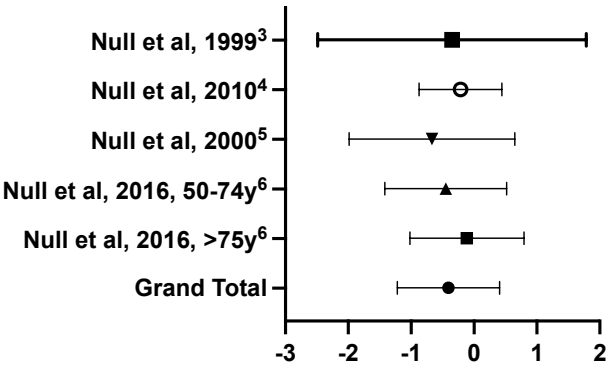
of stay for both the OMT and control groups. OMT criteria included the use of any fundamental OMT technique taught in osteopathic medical schools, including thoracic lymphatic pump, diaphragmatic and thoracic inlet myofascial release, cervical soft tissue techniques, bilateral rib raising, paraspinal muscle inhibition, and condylar decompression. The studies selected for this meta-analysis included osteopathic treatment times ranging from 15 to 20 minutes at least once a day. The Chi-squared test (χ^2), and Cochran's Q statistic were utilized in the meta-analysis with 95% confidence level using Microsoft® Excel® 365 as indicated in the text below. Figure 1 was generated using GraphPad Prism 9©.

Results:

Four studies met the inclusion criteria for meta-analysis.[3-6] The grand total effect size demonstrates that elderly patients with pneumonia who are treated with OMT have a statistically significant decrease in hospital length of stay compared to those undergoing conventional treatment alone (P = 0.000995 two-tailed). Effect size measures the strength of the relationship between two variables (hospital length of stay of OMT patient's vs conventional therapy patients) and given that the cumulative grand total effect size falls to the left of the y-axis, we can conclude that there is a significant decrease in hospital length of stay for OMT patients (Figure 1).

Figure 1: OMT and length of stay



Forest plot (blobbogram) of OMT and length of stay with each study. Reference 6 was divided into age groups 50-74, >75 year of age, lines 4 and 5 from the top.

Effect size was calculated using the means and standard deviations from four different studies (Table 1).

Table 1: Basic statistics on OMT studies

Study	Exp. n	Mean/ SD	Control n	Control Mean/SD
Noll et al, 1999[3]	11	13.5/6.3	10	15.8/6.4
Noll et al, 2010[4]	96	4.0/2.0	127	4.5/2.6
Noll et al, 2000[5]	28	6.6/2.94	30	8.6/2.92
Noll et al, 2016[6]				
Group 1: 50-74y	43	3.0/1.3	65	4.1/2.9
Group 2: >75y	53	4.4/3.0	62	4.8/3.8

Exp. = Experimental, SD = Standard Deviation

The χ^2 and Cochran's Q statistic were calculated to determine the heterogeneity of the studies used in this analysis. The p value for Q as χ^2 was determined to be 0.428, suggesting that the data used in this study is homogenous (the studies are showing the same effect). Homogeneity was further explored by calculating I^2, which was determined to be 0%. This calculation further proves that there is little variation among these studies and allows us to assume our results are accurate.

Discussion:

Pneumonia is an infection involving the lungs that can be caused by viruses, bacteria, or fungi. This infection causes fluid buildup in the alveoli and can result in significant pain and damage to a person's lungs. Pneumonia infections tend to be more severe in the elderly and serve as one of the leading causes of sepsis among elderly patients.[7] According to the Centers of Disease Control and Prevention (CDC), there were over 50,000 deaths due to pneumonia in 2015, a majority of which were in patients over age 65.[7] With the emergence of COVID-19, the number of pneumonia-related deaths has skyrocketed, with over 600,000 as of November 2021.[8] Along with this increase in mortality, there has also been an increase in the number of patients hospitalized with pneumonia. In 2019, there were an estimated 1 million hospitalizations due to pneumonia (American Thoracic Society) with an average length of stay of 6.5 days for patients over 65.[1]

The longer a patient stays in the hospital, the greater the burden of cost and resources are for healthcare centers. For pneumonia hospitalizations

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alone, the annual economic burden is estimated to be 9.5 billion dollars.[9] There are an estimated 5.3 million cases of community-acquired pneumonia (CAP) annually in the United States, with the highest incidence in individuals age 65 years and older at 4200 per 100,000 population.[9,10] A study by Niederman, et al. demonstrated an inpatient cost of 302 million dollars compared to an outpatient cost of 119 million dollars for patients with CAP over 65.[11] The high incidence of pneumonia-related hospitalizations coupled with the significant cost burden to both the patient and healthcare system from long stay hospitalizations serve as important driving factors for finding alternative means of prevention and treatment.

Multiple efforts have been made to improve outcomes for elderly patients with pneumonia and decrease healthcare costs. One such way is through the use of preventative pneumococcal vaccinations for adults, especially those aged 65 and older or those with comorbidities.[12] Studies have shown that although vaccination may not completely prevent the development of pneumonia, it may help reduce the severity of an acquired infection.[13] Following treatment guidelines and careful introduction of empiric antibiotics can also contribute to improving outcomes. Another avenue being explored to reduce cost and increase patient quality of life is decreasing the length of hospitalization. Some methods to reduce length of stay have included the use of a community-acquired pneumonia teams,[14] using a 3-step critical pathway to approach patients,[15] and the use of osteopathic manipulative treatment.

Osteopathic manipulative treatment (OMT) is a nonpharmacologic technique used by osteopathic physicians who are taught a holistic, hands-on approach to patient care and medicine. The founder of osteopathic medicine, Dr. Andrew Taylor Still, developed a philosophy that emphasizes the ability of the body to repair and regulate itself.[16] OMT can be used on its own or in combination with other treatment modalities to reduce pain, increase range of motion, improve circulation, and enhance the body's natural defenses.[17] With the multiple benefits of OMT, it is no surprise that investigators are beginning to research its utilization in hospitalized patients as a method of decreasing length of stay, reducing costs, and improving quality of life.

In this meta-analysis, we show that the use of OMT as an adjunctive therapy significantly shortens the length of stay in elderly patients hospitalized with pneumonia. By analyzing the data and results from 4 different studies, which compared the average hospital length of stay of patients who received conventional pneumonia treatment vs. the use of adjunctive OMT, we were able to calculate the cumulative effect size. The effect size is a statistical measurement of the strength of the relationship between two variables; in this case the hospital length of stay of conventional therapy patients and those who had adjunctive OMT. The grand total effect size in our analysis demonstrates that there is a statistically significant decrease in the hospital length of stay of patients who utilized OMT along with their conventional therapy. Our results also indicate that the data and results used had little variation amongst the different studies and that the studies were showing the same effect.

Osteopathic manipulative treatment can be greatly beneficial as an adjunctive therapy for those being treated for pneumonia, especially in the elderly population. Not only would it decrease the economic burden on hospitals and health systems, but it would also improve the patients' overall quality of life by decreasing their stay in the hospital. While the result from this meta-analysis suggests that there is a significant reduction of hospital length of stay after using OMT, there are many hospitals where OMT is underutilized and its use continues to decline.[18] Health systems and patients could greatly benefit from the utilization of OMT in the hospital setting, especially in regards to pneumonia management. More osteopathic physicians should consider the use of OMT as part of their treatment plans.

Conclusion:

As the prevalence of pneumonia increases, it is important to discover methods to help improve patients' quality of life and increase hospital resources. This can be accomplished by improving factors like shortening the hospital length of stay. Osteopathic manipulative treatment (OMT) is a nonpharmacologic technique that has been shown to naturally improve physiologic function and can be used as an adjunct to medications in the treatment of various disease processes. Based on this meta-

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analysis, the use of OMT in elderly patients hospitalized with pneumonia significantly decreased the hospital length of stay compared to those undergoing standardized treatment. As such, OMT should be utilized more in the hospital setting to better improve the lives of patients being treated for pneumonia.

Author Contributions:
All authors provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data, drafting and editing of the manuscript.

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