Commentary: Is there a carbon tax on prosthetic heart valves?

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Central Message

Use of a mechanical valve replacement for aortic valve replacement in Medicare-age patients continues to decline. Geographic variation exists in the selection of valves in this population.

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Surgical aortic valve replacement remains one of the most reproducible, highly standardized cardiac surgical procedures, with low operative mortality and risk in patients who are at low to intermediate risk for aortic valve replacement surgery. One would therefore assume that the choice of prosthesis to surgically replace the aortic valve—mechanical or biological—would similarly be standardized and relatively uniform across the United States. This assumption is challenged in an intriguing article published by Du and colleagues¹ in this issue of the *Journal*.

Du and colleagues¹ retrospectively analyzed patients older than 65 years enrolled in Medicare who underwent surgical aortic valve replacement from 2006 through 2015. Medicare claims data identified patients older than 65 years who received biological or mechanical valve prostheses for aortic valve replacement. They observed 3 findings. The majority of patients in the United States received biological valves during this period. The younger age group of patients (65-74 years) received the greatest number of mechanical valves. The number of mechanical valves in the entire cohort decreased from 2006 through 2015. These findings are congruent with other studies,² which have shown a similar decline of mechanical valve use in the United States.

The novel and surprising finding from this study is the wide geographic variation in the use of mechanical versus bioprosthetic valves. In Texas, 42% of the aortic valve replacements for this population older than 65 years are performed with mechanical valves; in Vermont, 8% of aortic valve replacements are performed with mechanical valves. In general, there was a nearly 3-fold difference in the use of mechanical valves between the northeastern and the southeastern United States.

So what factors could explain this difference? It is far too simplistic to conclude that the northeastern and southeastern United States are culturally and geographically very different places. Of note, 90% of the patients in this cohort

were thought to have nonrheumatic aortic stenosis—so valve disease-specific differences are likely not the reason for this difference. Indeed, there is precedent for geographic variation in the use of coronary angiography and percutaneous coronary intervention in Medicare beneficiaries in the United States.³ If one views this geographic variation from a health care delivery standpoint, this type of variation is of concern.⁴ Approximately 44,000 patients—more than 50% of the patients in this study receiving mechanical valves—were older than 75 years and received a mechanical valve prosthesis. These data stand in stark contrast to our Northern European colleagues, who cite that in a similar time frame 95% of patients older than 70 years received a tissue valve.⁵ Finally, the most recent set of valvular guidelines suggests that it is recommended to place a bioprosthetic valve in patients older than 70 years.⁶

One very cogent critique of this study is that it did not include the period in which transcatheter aortic valve replacement accelerated in use. We might not ever understand these geographic differences underlying mechanical or bioprosthetic aortic valve replacement; however, it clearly appears that the use of mechanical valves is universally declining in the United States.

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