

Expandable Cages, Spine Implants

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Device

Spine implant cages are hollow devices (typically metallic or poly ether ethyl ketone) that are placed in between vertebrae, after removal of a damaged disc, during spinal fusion surgery. Cages may be implanted in the cervical or lumbar spine and are traditionally fixed/static (not able to expand). Recent technology has led to the addition of cages that are expandable. When inserted they are in contact with the vertebral endplates and filled with bone graft material to help fuse the two adjacent vertebrae.¹ Expandable cages are designed to be extended after implant in order to facilitate smaller insertion site (reducing nerve root retraction) while restoring maximum vertical height and anterior column support.²

Actions for Consideration

Partner: Identify orthopedic and neuro spine surgeons, nurses, and the appropriate clinical and non-clinical value analysis team members. A physician champion will be particularly helpful in understanding utilization and adoption of this technology. Reimbursement specialists may be particularly helpful within this category.

Connect: Collecting and reviewing physician interest and data including usage, cost, and outcomes will help inform management of these products. The difference in price from a static cage to an expandable cage will be crucial to understanding the financial impact of adoption of these technologies. Physician interest or requests for these products should be handled through the value analysis team, ensuring a physician leader is included in the discussion. Reimbursement information should be attained. Identify evidence related to specific products.

Communicate: Educate the team on product information and physician utilization. Discuss pricing, reimbursement, and potential development of protocols for use. Robust data sharing will not only enhance discussions, but may lead to actionable conversations between peers.

HealthTrust Resources: Access the [Clinical Knowledge Insights Library](#) to find other relevant documents and toolkits with actionable information. Examples for this product include resources on value analysis and physician engagement.³ Network on [HealthTrust Huddle](#), our member community that shares ideas and seeks guidance from colleagues.⁴

Clinical Evidence

There are numerous studies, with variable results, related to expandable cage technology and surgical outcomes (many with direct comparison to static cages). Samples are included below:

- A 2022 meta-analysis by Lin et al. compared outcomes in patients with transforaminal lumbar interbody fusion (TLIF) utilizing expandable versus static cages. Ten studies with 1,440 patients, at a minimum 6 month follow up, were included. Findings included, that while no statistical significance was reached compared to static cages, expandable cages were linked to “significant restoration” of anterior disc and foraminal heights. Expandable also showed an increase in posterior disc height and “significantly better” functional outcomes. There was no statistically significant difference found between the two in regards to fusion rates, cage subsidence, sagittal alignment, or pelvic parameters. Limitations included all studies being retrospective, gaps in data on outcomes, minimally invasive versus open TLIF was not analyzed, and absence of long-term results.⁵
- A 2020 retrospective, minimum five year follow up, study by Kim et. al evaluated posterior stand-alone expandable cages (n=69) versus lumbar interbody fusion with pedicle screw insertion (n=80) for implant

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safety and ability to restore and maintain sagittal balance. They concluded that while expandable allowed for shorter operative time and low proximal junctional kyphosis rate, they contributed to longer hospitalization, higher rates of subsidence and pseudoarthrosis, did not restore global sagittal balance, and that implant safety could not be proven without further studies. Limitations included retrospective design, loss of patients to follow up, potential confounding factors, inclusion of only a single spine center, and that there have been “major advances” in bone-forming agents and cage materials since treatment of the cohort included.⁶

- A 2023 retrospective study by Kucharzyk et al. evaluated radiographic and spinopelvic changes, patient-reported outcomes, and the incidence of non-union and revision surgery (up to two years following surgery) in static (n=50) versus expandable (n=50) transforaminal lumbar interbody fusion devices. They concluded that in “patients who underwent transforaminal lumbar spinal fusion via minimally invasive surgery, the expandable cage demonstrated significantly improved radiographic and patient reported outcomes compared to a static cage over two years.” In addition, there was no statistically significant difference in non-union or revision surgery between the two. Limitations included the study being unblinded and retrospective, sample size, variety of diagnoses included, limitation to patients that had L4-L5 or L5-S1 surgery only, and only one brand of each type of cage were included.⁷
- A 2023 systematic review and meta-analysis by Das et al. compared radiological and clinical outcomes following cervical corpectomy utilizing static versus expandable cages. After review for eligibility requirements, 26 studies (1,170 patients) were included. They evaluated change in segmental angle, subsidence rate, fusion rate, displacement rate, and rate of reoperation. They concluded that expandable cages provide a higher degree of improvement in segmental angle and lower subsidence; however, they had a lower fusion rate, higher displacement rate, and higher rate of reoperation. Limitations included variation in follow up duration of the two treatment groups, limitation to evaluating only segmental angle (not including cervical sagittal alignment), and lack of reporting regarding effect of cages on adjacent segments disease.⁸

Physician Advisor Insight

A panel of orthopedic spine and neurosurgeons within our HealthTrust Physician Advisor Network offered the following insight with regard to expandable cages⁹:

- Expandable allow a smaller insertion for corpectomies by expanding in situ.
- Potential for expandable use in TLIF cases.
- May prevent fusion in kyphosis due to static cages.
- Both should be available depending on the need.
- The premium for expandable is potentially not warranted.
- Expandable depend on fusion around the cage as opposed to traditionally through the cage.
- There is less room for bone in graft windows with expandable.
- Kyphosis correction is paramount to avoiding the need for repeat surgery.
- Static cages possibly provide comparable results for simple spinal fusions.
- It may be important to have expandable available for posterior approaches. They facilitate lordosis while keeping the load on the endplates parallel to surfaces of the cage.

Summary

The type of cage and techniques utilized in spinal fusion surgery vary by physician, meaning that physicians are the decision makers and may have a preference of one type of product over another. Engaging physicians in decision making and identifying and leveraging physician champions will help to maintain collaboration over time. Partnering with key stakeholders, robust data sharing, and educating product and physician utilization across the team will help guide peer discussions around appropriate use and potential guideline development.

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