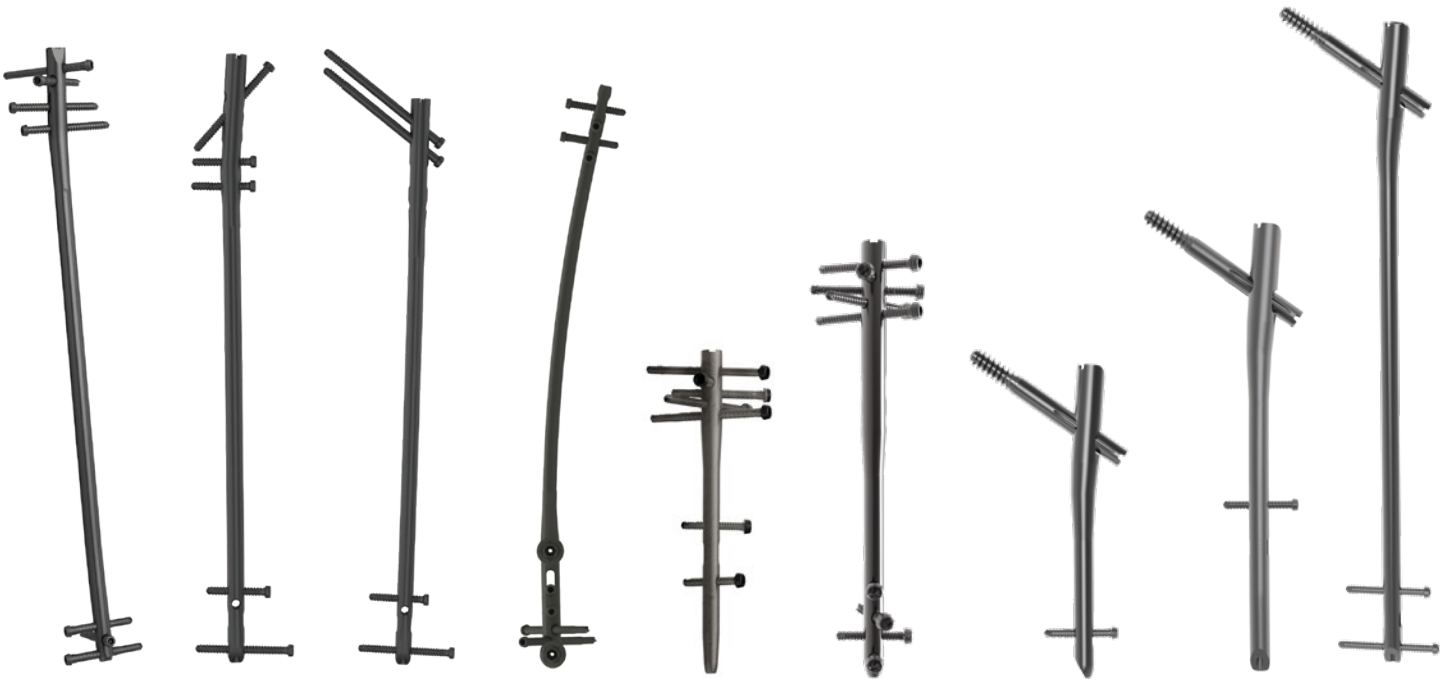
stryker

Trauma

Nailing Portfolio

Value brief



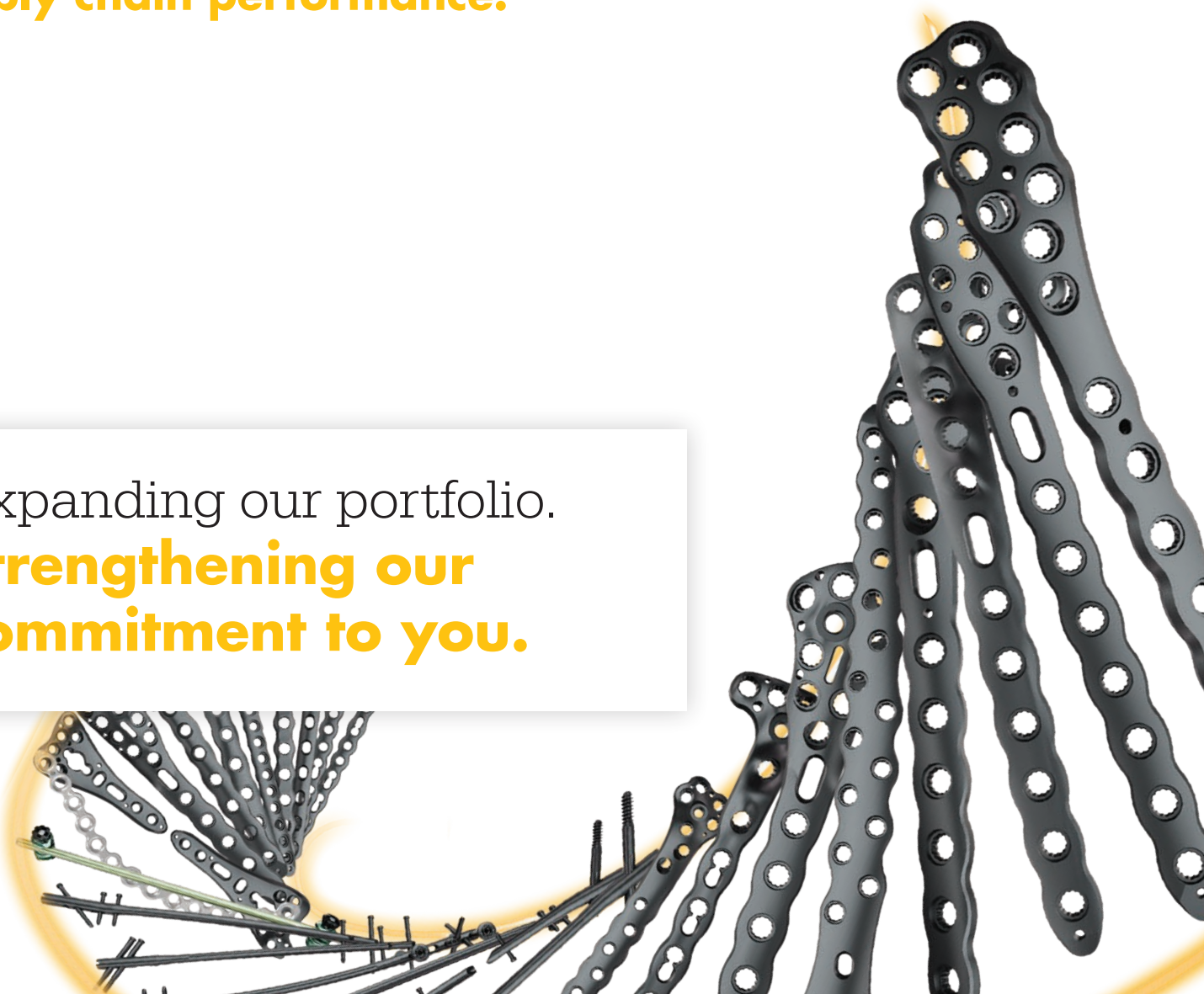
Expanding possibilities; one nail at a time

Trauma is complex.

At Stryker, we understand today's orthopaedic trauma environment demands more than just clinical innovation - it demands solutions integrating seamlessly into your supply chain strategy. The Gamma4 and T2 Alpha platforms are built on a foundation of product quality, and innovative technology.

By aligning product quality with operational efficiency, we aim to reduce clinical variation, control costs, and support your hospital's broader goals: **improved patient outcomes, lower total cost of care, and streamlined supply chain performance.**

Expanding our portfolio.
Strengthening our commitment to you.



Stryker Nailing Portfolio

T2 Alpha

The power to do more.

Femur Antegrade Piriformis Fossa (PF)

Femur Antegrade Greater Trochanter (GT)

Femur Retrograde

Tibia

Humerus

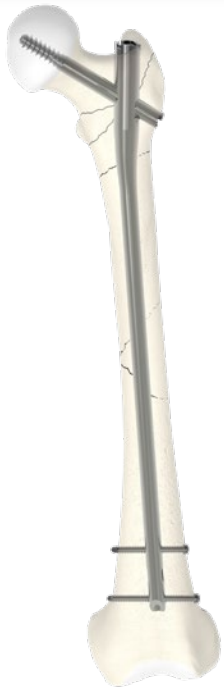
Gamma4

We aren't proven because we have a legacy.

We have a legacy because we are proven.

Trochanteric Nail

Intermediate Nail



Long Nail

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Review of orthopaedic trauma

What is orthopaedic trauma?

- Any serious injury to the bones, joints, and/ or soft tissue.
- Injuries can range from a simple hairline fracture to life-threatening accidents.
- Common causes of injuries are low-energy accidents in elderly patients.

How are fractures treated?

Trauma patients are highly variable in their spectrum of injury and can be surgically treated with a variety of implant types, such as plates, nails, screws and external fixation depending on the fracture type, patient specific conditions, and surgeon preference

What is intramedullary nailing?

Intramedullary nailing is a surgical technique used to repair fractures of long bones – such as the femur (thigh bone), tibia (shin bone), or humerus (upper arm bone). In this procedure, a metal rod, called an intramedullary nail, is placed inside the hollow center of the bone. Intramedullary means 'within the marrow' or in the bone. The nail acts as an internal support, designed to hold the bone in the correct position so it can heal properly.[26]

When is intramedullary nailing used?

- Fractures of the femur, tibia, or humerus
- Long bone fractures caused by trauma or injury
- Certain types of hip fractures

What are the potential benefits?

- **Load Sharing for Natural Healing** – Intramedullary nails are positioned along the bone's natural weight-bearing axis. This allows the bone and implant to share the load, creating a natural healing environment.[30]
- **Early Weight Bearing** – Because the implant allows for strong, stable support,[34] many patients can begin putting weight on the limb sooner. Early mobility encourages the body to form the bone-healing (callus) needed for recovery.
- **Return to Movement** – For older patients especially, getting out of bed and moving earlier can help maintain joint flexibility, muscle strength, and independence during recovery.

28,084*
nailing procedures done annually[26]

70%
of nailing patients are older than 65[26]

97%
of nailing procedures require inpatient admission[26]

***based off 2022 data**

Pain points in orthopaedic trauma

Clinical

1. Non-anatomical fit

Proper implant fit is important. If the implant doesn't fit correctly, it may lead to fracture misalignment or patient discomfort.

2. Screw failure

Screw failure occurs when a screw used to secure the implant loosens, bends, or breaks. If screws fail, the implant may no longer hold the fracture stable.

3. Implant breakage

When the actual implant breaks/fails. This can be the result of stress concentration on the implant due to poor reduction, inadequate stability or early weight-bearing. This is common in high stress areas like hips or femurs, especially if the patient early weight bears.[40]

Financial & Operational

1. Revision surgeries

Implant failure or complications may lead to revision surgery. Revisions are often times more expensive because they require extra operating room time, longer hospital stays, and additional implants.[29]

2. Platform Variability Increases Cost, Complexity, and Risk[35]

Every tray opened for surgery must go through decontamination, washing and sterilization. Too many trays can slow down case turnover, and increase sterilization costs.

3. Inventory management

Hospitals may have limited storage for implants/ instrument sets, and because of the unpredictable nature of trauma, there is a large number of SKUs. Keeping a large variety of systems may increase complexity and cost management.

Clinical Challenge #1

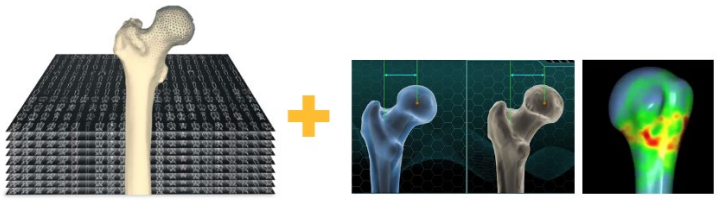
Non-anatomical fit

Why does implant fit matter?

- **Fracture reduction:** If an implant doesn't fit the bone well, the fracture pieces may not line up correctly, which is defined as malreduction. Poor alignment can lead to delayed healing, abnormal bone shape, or long-term functional issues for the patient.[36]
- **Anterior perforation in femur nailing:** If the nail doesn't match the natural curve of the femur, the tip of the nail can push against or even perforate the front (anterior) part of the bone. This can cause pain, fracture expansion, or require revision surgery, all of which increase recovery time.
- **Soft tissue irritation:** Implants that don't sit flush on the bone can rub or press against surrounding muscles, tendons, or skin. This can lead to pain, swelling, wound problems, or even the need for implant removal once the fracture is healed.
- **High stress on bone or implant:** A poor fit puts extra stress on certain parts of the implant or bone. Instead of the load being evenly shared, one area bears the brunt. This increases the chance of screw loosening, implant breakage, or bone fracture — which can require another surgery.

How do Stryker nails address fit?

SOMA (Stryker Orthopaedic Modeling and Analytics)



Database of 6,000 clinical CT scans and over 40,0000 3D bone models.[1]

Analytical resources developed and maintained by an experienced engineering team, including anatomical measurements, density assessments and fracture heatmaps.

SOMA studies found that Stryker femoral nails have a better fit compared to competitors[37] *

Length dependent radius of curvature

All of Stryker's long nails have varying curvature dependent on nail length, designed to create the best fitting implant.[2] The longer the bone, the straighter the nail. The shorter the bone, the more bend in the implant, because that matches natural anatomy. Mismatch of the ROC of the femur and nail is a key factor in potential anterior femoral cortical perforation, as has been confirmed in multiple studies.[3,11,12,13,14]

Periprosthetic implant

With the amount of periprosthetic fractures rising it's critical to have implants that can be used for both native fractures and periprosthetic indications due to the varying start points.[28] The Stryker T2 Alpha Femur Retrograde nail has a (1-5°) variable bend that can be used for a standard start point or a periprosthetic start point.[6]

Comprehensive sizes

- Size offerings to meet diverse populations and patient sizes
- SOMA bone model analysis influence size offerings of implants
- Expansive database designed to create optimal lengths

***compared T2 Alpha Femur Antegrade vs. Zimmer Natural nail; Gamma4 vs. Synthes TFNA**

Clinical Challenge #2

Screw failure: Why do screws fail?

In orthopaedic trauma surgery, screws are critical to maintaining stable fixation and supporting the healing process. However, there are several reasons why screws can fail, leading to loss of fixation, delayed healing, or the need for revision surgery. The most common modes of screw failure include:

Backout – Locking screws, used to secure nails or plates to bone, can loosen over time if fixation is unstable or if repetitive loading occurs before the fracture is healed. When this happens, the screw can gradually "back out" of its hole, protruding into surrounding soft tissue or skin. This can cause pain, reduce stability, and compromise healing.

Breakage – If the fracture is slow to heal or if the implant is subjected to excessive or repeated mechanical stress, screws may fatigue and fracture. Breakage can occur at the screw head, shaft, or thread, often making removal more difficult and requiring additional intervention.

In short: screw failure is often the result of a combination of surgical technique, patient factors (such as bone density and activity level), and mechanical loading during the healing period. Understanding these failure modes helps guide proper implant selection, positioning, and patient management to reduce the risk of complications.

How does Stryker's nailing platform address screw failure?

Screw backout

Advanced Locking Screws

Based on a comparative clinical study, Stryker's T2 Alpha system demonstrated 5% distal screw backout compared to over 30% in a competitor's system.[17]

Tapered diameter screws that engage with threads on the inside of nail to lock into the nail

- Added axial and angular stability[4,17]
- Great for patients with poor bone quality or fractures near the joint space[17]

Rotational stability

RC Lag Screw

The RC lag screw stands for "Rotational Control" screw. This screw combines a standard lag screw, with a blade to increase stability in unstable fractures compared to standard lag screw only.

2mm

2mm wider spread compared to standard lag screw[31]

15%

Higher resistance to cut-out[31]

Screw stabilization

PEEK Insert

PEEK is a polymer insert that sits within the locking screw holes to give added resistance against backout.[32]

Clinical Challenge #3

Implant breakage: Why do implants break?

Orthopaedic implants are designed to withstand the mechanical demands of supporting a healing fracture, but they are not indestructible. When the forces placed on an implant exceed its mechanical limits—especially over time—failure can occur. The most common causes include:

Notch sensitivity – Implants, may be strong and biocompatible, but also can be vulnerable at points where there are sharp edges, small defects, or machining marks. These areas create stress concentrators—locations where force is focused rather than evenly distributed. This can lead to early fatigue and fracture of the implant under repetitive loading.

Lack of stability – If the fixation construct is not stable—due to poor bone quality, suboptimal implant selection, or inadequate screw placement—excessive motion can occur at the fracture site. This movement increases the mechanical demands on the implant and can accelerate fatigue failure.

In short: implants are intended to share the load with the bone during the healing process—not carry it entirely. The combination of proper surgical technique, good bone quality, and controlled patient activity is essential to reduce the risk of implant breakage and facilitate successful outcomes.

Excessive stress from poor reduction – When a fracture is not well reduced (aligned), the implant may bear more load than intended because the bone ends are not sharing the mechanical forces. Over time, this uneven load transfer can cause the implant to bend, deform, or break.

How does Stryker's nailing platform address implant breakage?

Guided targeters

77%

Less radiation exposure than freehand locking[3]

64%

Shorter fluoroscopy time than freehand locking[3]

- Designed to assist in placing locking screws and provide reproducible locking.
- Provides a guided path for drilling to engage with nail.

Advanced Locking Screws

35%

Increased fatigue strength*[4]

- Designed to provide added axial and angular stability by limiting relative movement between the nail and screw[5]
- Designed to have less implant toggle and less implant toggle and higher construct stability compared to standard IMN locking screws.[5]
- Fixed angle constructs may be advantageous in providing stability in short segments and bones with poor bone quality[5,24]

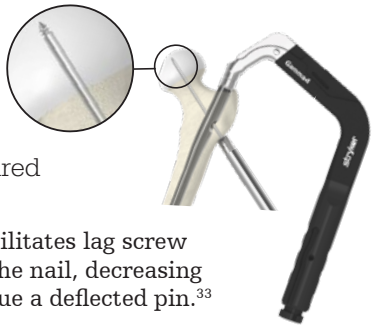
Controlled compression

- Designed to provide controlled compression opposed freehanded to backslapping
- Designed to provide visualization of how much compression is achieved

*compared to 5mm T2 Alpha Locking Screws

Precision Pin™

Wire with increased diameter



66%

Reduction of skiving compared to a standard K-wire.[6]

The reduced pin deflection facilitates lag screw placement centrally through the nail, decreasing the risk of implant notching due a deflected pin.[33]

Financial and Operational Challenge #1

When implants fail: the operational toll of unplanned revisions

4,305
Patients received revision cases between 2016-2023[29]

1,915
of these patients are returning due to implant failure

How much do these revision operations cost?

In 2023, there were 418 revision procedures, in the United States, costing hospitals an additional $12.64M[29]

Average initial surgery costs
$26,968

Average revision surgery costs
$30,249

Stryker's nailing platform addresses this challenge by creating implants designed to fit - see Clinical Challenge #1.

Financial and Operational Challenge #2

Platform Inconsistency Increases Cost, Complexity, and Risk[35]

25.7 billion
annual overspending of hospitals due to supply chain challenges[18]

17 to 45%
of hospital expenses are generated in supply chain[20]

In healthcare, consistency builds quality. Orthopaedic trauma patient care could be compromised if mistakes are made in the OR. By providing consistency across platforms, staff become more familiar with the instrumentation, which could reduce mistakes made under pressure.[27] Stryker's nailing platform is designed to save time and increase productivity by reducing the number of trays your hospital staff uses.[25] This is essential today, as hospitals work through increased employee turnover in supply chain and nursing.

101.4%
of the RN workforce turned over in 5 years*[21]

85%
of nurses plan to leave hospital roles one year from now based on a 2023 survey[22]

75%
of clinicians found that supply chain inefficiencies hurt their productivity[23]

Decreasing inconsistency with 1 Core Nailing Instrument Tray

Even as new staff join the hospital team, patients still expect—and deserve—high-quality care. The T2 Alpha and Gamma4 systems are designed with a consistent and simplified instrument platform, allowing new employees to train more quickly and confidently.[25] By maintaining a similar look, feel, and workflow across different instrument sets, the staff is able to provide effective support without needing to learn intricacies among different product trays.

Supply expenses are the second largest cost category in a hospital and are highest in hospitals with a complex case mix index (CMI), including orthopaedic trauma cases. Product standardization is a key element to improving supply chain efficiencies and enhancing both financial and clinical performance.[18,19]

Streamlined platform for efficiency and cost savings[25]

The T2 Alpha and Gamma4 systems utilize a shared screw and instrument platform that supports procedural consistency and simplifies logistics. This system-wide standardization:

1. May allow for the reduction of instrument trays which can reduce costs associated with SPD reprocessing.
2. One core tray is designed to minimize SKU quantities which may allow for lower inventory carrying costs.
3. Consistent tray design may allow for an accelerated training process for perioperative staff.

By reducing the variability of sets, redundancies in both operating room and sterilization processing departments can be reduced and inventory management can be optimized to help with direct cost-savings.[38,39]

*2018-2023

Financial and Operational Challenge #3

Inventory Management

Driving value through visibility

Trauma care can become costly for health systems when there is limited visibility into spending patterns, product utilization, waste, and operational efficiencies. Without this insight, opportunities to standardize care and reduce costs may be missed.

Gaining better visibility into these factors enables hospitals to develop an actionable plan for contracting and purchasing within the orthopaedic trauma service line; supporting informed decisions, reducing waste, and optimizing both clinical and financial outcomes.

> Trauma implant products, encompass an estimated **275,000** devices and typically total **65%** of an OR's operational expenses.[8]

Stephanie Falconer, RN, Manager - Alliance, Strategic Marketing for Stryker Trauma explains:

> "Visibility into the trauma and extremities service line can help with predictive spending, cost analysis and efficiencies around inventory management."[7]

Greater visibility into surgical case volume, implant utilization, and inventory efficiency allows hospitals to make more informed decisions, optimize resources, and plan strategically for the future. Programs like Stryker's Alliance build on this insight by providing actionable data and tools to drive operational efficiency, improve financial planning, and help support having the right implants available.

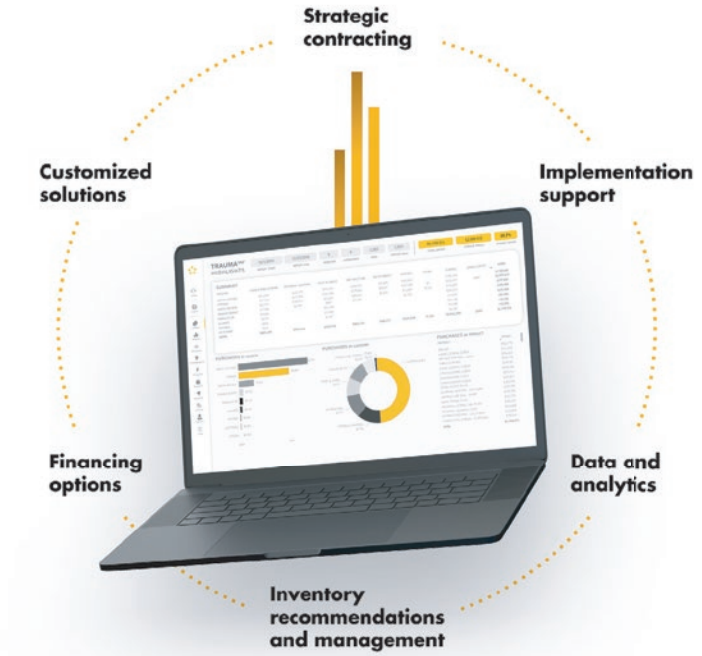
Alliance Trauma Value Program

You're in control.

Strategy. Solutions.
All from a single source.

Running an orthopaedic trauma service never slows down. Every choice—from patient care to inventory and cost control—shapes outcomes. That's why we created Alliance, a value-added program designed with trauma care at its core.

Alliance simplifies trauma procurement by connecting patient care and supply chain management. You can pick the right blend of strategic contracting, inventory management, education, and implementation support to fit your service line, giving you **flexibility and control from the start.**



Smoother, seamless implementation

From planning to execution, our project management team helps streamline transitions, align key stakeholders, track compliance and provide real-time guidance for seamless, stress-free rollouts.

We will be with you at every step. **We're in this together.**

1	2	3	4	5	6	7	8
hold planning kickoff	establish transition team	determine go-live date	create inventory plan	sign agreement	place initial order	perform in-service trainings	go-live

Sustaining

establish business review cadence

Let's build an Alliance

Visit us at alliancecanhelp.com

We are committed to meet all your trauma needs.

	Stryker[41-48]	J&J[49-59]	Smith & Nephew[60-67]	Zimmer Biomet[68-74]	Arthrex[75-84]
Femur Greater Trochanter Nail	✔	✔	✔	✔	✔
Length dependent RoC	✔	✗	✔	✔	✗
Distal Targeter	✔	✗	✔	✗	✗
Advanced Locking Screws	✔	✗	✗	✔	✗
Database of bone scans	✔	✔	✗	✗	✗
Controlled Compression	✔	✗	✔	✔	✔
Femur Piriformis Fossa Nail	✔	✔	✔	✔	✗
Length dependent RoC	✔	✗	✗	✔	✗
Distal Targeter	✔	✗	✔	✗	✗
Advanced Locking Screws	✔	✗	✗	✔	✗
Database of bone scans	✔	✔	✗	✗	✗
Controlled Compression	✔	✗	✗	✔	✗
Retrograde Femur Nail	✔	✔	✔	✔	✔
Dual option - periprosthetic	✔	✗	✗	✗	✗
Short nail	✔	✔	✔	✗	✔
Advanced Locking Screws	✔	✗	✗	✔	✗
Proximal Targeting Device	✔	✗	✗	✔	✔
Length dependent RoC	✔	✗	✗	✗	✔
Database of bone scans	✔	✔	✗	✗	✗
Controlled Compression	✔	✗	✗	✗	✔
Tibia Nail	✔	✔	✔	✔	✔
Advanced Locking Screws	✔	✗	✔	✔	✗
Database of bone scans	✔	✔	✔	✗	✗
Controlled Compression	✔	✔	✔	✔	✔
Hip Fracture	✔	✔	✔	✔	✔
Lag screw - rotational control	✔	✔	✔	✔	✔
Precision Pin	✔	✗	✗	✗	✗
Advanced Locking Screws	✔	✗	✗	✗	✗
Database of bone scans	✔	✔	✔	✗	✗
Intermediate Nail	✔	✔	✔	✗	✗
Lag screw - rotational control	✔	✔	✔	✗	✗
Length dependent RoC	✔	✗	✗	✗	✗
Distal Targeter	✔	✗	✔	✗	✗
Precision Pin	✔	✗	✗	✗	✗
Advanced Locking Screws	✔	✗	✗	✗	✗
Hip Fracture Long Nail	✔	✔	✔	✔	✔
Lag screw - rotational control	✔	✔	✔	✔	✔
Advanced Locking Screws	✔	✗	✗	✗	✗
Length dependent RoC	✔	✗	✗	✗	✔
Precision Pin	✔	✗	✗	✗	✗
Distal Targeter	✔	✗	✗	✗	✗
Database of bone scans	✔	✔	✔	✗	✗
Humerus	✔	✔	✔	✔	✔
Advanced Locking Screws	✔	✔	✔	✔	✗
Distal Targeter	✔	✗	✗	✗	✗
Database of bone scans	✔	✗	✗	✗	✗
PEEK insert	✔	✔	✔	✗	✗
Controlled Compression	✔	✔	✗	✗	✔

References:

1. Internal report № D0000124129, Rev AF
2. White Paper Femoral nailing systems: Length dependent ROC - Anatomical Fit - Proximal Protrusion (SOMA), SOMA-WP-2, 11-2023
3. Konda SR, Maseda M, et al. Observational prospective unblinded case-control study to evaluate the effect of the Gamma3® distal targeting system for long nails on radiation exposure and time for distal screw placement, Injury. 2023;54(2):677-682. doi:10.1016/j.injury.2022.11.046
4. White Paper, Fatigue Strength of Locking Screws, T2-WP-6, Rev 1
5. Naidu SH, Bixler B, et al. Percutaneous pinning of proximal humerus fractures: a biomechanical study. Orthopedics. 1997;20(11):1073–6.24. 2. doi: 10.3928/0147-7447-19971101-13.
6. Internal Reports № D0000099352, Rev AE & D0000294387, Rev AA.
7. White Paper, Ortho Trauma and the Supply Chain (2024) https://www.jhconline.com/ortho-trauma-and-the-supply-chain.html (Accessed: 2 October 2025).
8. Alliance HPN White Paper - Using Data Analytics in Orthopaedic Healthcare Decision-Making May 31 2024; Accessed Sep 15 2025, https://www.hpnonline.com/whitepapers/whitepaper/55055366/using-data-analytics-in-orthopaedic-healthcare-decision-making.
9. Trauma Nailing Brochure, TR-GSNPS-PRDC-1891500
10. Hsu CC, Yongyut A, et al. Notch sensitivity of titanium causing contradictory effects on locked nails and screws. Med Eng Phys.2010;32(5):454-60. doi: 10.1016/j.medengphy.2010.03.006
11. Buford WL Jr, Turnbow BJ, et al. Three-dimensional computed tomography-based modeling of sagittal cadaveric femoral bowing and implications forintramedullary nailing. J Orthop Trauma. 2014 Jan;28(1):10-6. doi: 10.1097/BOT.0000000000000197.
12. Harma A, Germen B, et al. The comparison of femoral curves and curves of contemporary intramedullary nails. Surg Radiol Anat. 2005Dec;27(6):502-6. doi: 10.1007/s00276-005-0019-28.
13. Maratt J, Schilling PL, et al. Variation in the femoral bow: a novel high-throughput analysis of 3922 femurs on cross-sectional imaging. J OrthopTrauma. 2014 Jan;28(1):6-9. doi: 10.1097/BOT.0b013e31829ff3c99.
14. Schmitt A, Letissier H, et al. Three-dimensional orientation of the femoral curvature. How well does it match with the sagittal curvature of femoralimplants? Orthop Traumatol Surg Res. 2019 Feb;105(1):11-16. doi: 10.1016/j.otsr.2018.09.01810
15. Pangea hospital pack, PGA-BR-7, 08-2025
16. Design Rationale – T2 Alpha Femur Retrograde,
17. Musick AN, Wagner RK, et al. Distal Interlocking Screw Backout in New-Generation Retrograde Femoral Nails. J Orthop Trauma. 2025; doi: 10.1097/BOT.0000000000003043. Epub ahead of print
18. Gholson JJ, Noiseux NO, et al. Patient Factors Systematically Influence Hospital Length of Stay in Common Orthopaedic Procedures. IowaOrthop J. 2017;37:233-237.7.
19. Becker's Healthcare / Cardinal Health, Health system leaders weigh in on supply chain transformation, Accessed Jun 27, 2023. https://assets.asccommunications.com/whitepapers/cardinal-supply-chain-wp-gated-august-2022.pdf8.
20. Abdulsalam Y, Schneller E. Hospital Supply Expenses: An Important Ingredient in Health Services Research. Med Care Res Rev.2019;76(2):240-252. doi:10.1177/1077558717719928
21. Advisory Board, Charted: The impact of nurse turnover in 2022, Accessed Jun 27, 2023. https://www.advisory.com/daily-briefing/2023/04/11/rn-turnover#:~:text=Over%20the%20past%20five%20years%2C%20the%20average%20hospital%20turned,101.4%25%20of%20its%20RN%20workforce.&text=In%20addition%2C%20RN%20turnover%20across,higher%20than%20the%20national%20average.13.
22. Ashleigh Hollowell (Twitter). 85% of nurses plan to leave hospital roles 1 year from now: Survey. Accessed Jun 27, 2023. https://www.beckershospitalreview.com/nursing/85-of-nurses-plan-to-leave-hospital-roles-1-year-from-now-survey.html14.
23. A Smart Supply Chain Supports Value-Based Care. Cardinal Health. Accessed Jun 27, 2023. https://www.beckershospitalreview.com/supply-chain/a-smart-supply-chain-supports-value-based-care.html
24. Horn J, Gueorguiev B, et al. Biomechanical evaluation of two-part surgical neck fractures of the humerus fixed by an angular stable locked intramedullary nail. J Orthop Trauma. 2011;25(7):406–13. doi: 10.1097/BOT.0b013e3181ffdf9a.
25. Internal Report № D0000276775
26. Internal Report № D0000389090, Rev AA
27. Food and Drug Administration, 2016. Applying human factors and usability engineering to medical devices: guidance for industry and Food and Drug Administration staff. Food and Drug Administration: Rockville, MD, USA.
28. Williams JA, Khawar H, et al. Periprosthetic femoral fractures. Br J Hosp Med (Lond). 2024;85(2):1-9. doi: 10.12968/hmed.2023.0378
29. Internal Report № D0000389090, Rev AA
30. Tarr RR, Wiss DA. The mechanics and biology of intramedullary fracture fixation. Clin Orthop Relat Res. 1986 Nov;(212):10-7. PMID: 3769275.
31. Internal Reports № D0000245312, Rev AE & № D0000093463, Rev AC
32. Internal Report № D0000379920, Rev AC
33. Klima ML. Comparison of Early Fatigue Failure of the TFNa and Gamma 3 Cephalomedullary Nails in the United States From 2015 to 2019. J Orthop Trauma. 2021;35(2):e39-e44. doi:10.1097/BOT.0000000000001864
34. Internal reports № D0000350215, Rev AB & № D0000343955, Rev AB
35. Eussen MMM, Logghe E, et al. Reducing surgical instrument usage: systematic review of approaches for tray optimization and its advantages on environmental impact, costs and efficiency. BJS Open. 2025;9(3):zraf030. doi: 10.1093/bjsopen/zraf030.
36. Yale Medicine, All Definitions, Malunion of Femur Fracture, https://www.yalemedicine.org/clinical-keywords/malunion-of-femur-fracture; accessed 22-SEP-2025
37. T2 Alpha Femur Retrograde vs. T2 SCN (Internal Report № A0046864, Ver 1)
38. Toor J, Bhangu A, et al. Optimizing the surgical instrument tray to immediately increase efficiency and lower costs in the operating room. Can JSurg. 2022;65(2):E275-E281. Published 2022 Apr 12. doi:10.1503/cjs.022720
39. Ribes-Iborra J, Segarra B, et al. Improving perioperative management of surgical sets for trauma surgeries: the 4S approach. BMC Health ServRes. 2022;22(1):1298. Published 2022 Oct 28. doi:10.1186/s12913-022-08671-2
40. Guang-Shu Yu, Yan-Bin Lin, Stability of intertrochanteric fractures and evaluation of proximal femoral nail antirotation treatment: A systematic review, Advanced Orthopaedics, Volume 1, 2025, Pages 17-29, ISSN 3050-7170, https://doi.org/10.1016/j.advop.2025.04.002.
41. Stryker, 2025.Gamma4 Hip Fracture Nailing System. Available at: https://www.stryker.com/us/en/trauma-and-extremities/products/gamma4.html (Accessed 2 October 2025).
42. Gamma4 Hip Fracture Nailing System Operative Technique, G4-ST-1, Rev-3, 07-2023
43. Stryker, 2025 T2 Alpha Femur Antegrade GT/PF Intramedullary Nailing System. Available at: https://www.stryker.com/us/en/trauma-and-extremities/products/t2-alpha-femur-antegrade-gt-pf.html (Accessed 2 October 2025).
44. T2 Alpha Femur Antegrade GT/PF Nailing System Operative Technique, T2-ST-17_Rev-5, 02-2019
45. Stryker. (2025) T2 Alpha Femur Retrograde Nailing System. Available at: https://www.stryker.com/us/en/trauma-and-extremities/products/t2-alpha-femur-retrograde.html (Accessed: 2 October 2025).
46. T2 Alpha Femur Retrograde Nailing System Operative Technique, T2-ST-37_Rev-1, 09-2022
47. Stryker. (2025) T2 Alpha Tibia Nailing System. Available at: https://www.stryker.com/us/en/trauma-and-extremities/products/t2-alpha-tibia.html (Accessed: 2 October 2025).
48. T2 Alpha Tibia Nailing System Operative Technique, T2-ST-20, Rev 4, 10-2019
49. Johnson & Johnson MedTech. (2025) Advanced Nailing System. Available at: https://www.jnjmedtech.com/en-US/product/advanced-nailing-system (Accessed: 2 October 2025).
50. DePuy Synthes. (2023) FRN-ADVANCED™ Femoral Recon Nailing System. Available at: https://www.jnjmedtech.com/en-US/product/frn-advanced-femoral-recon-nailing-system (Accessed: 2 October 2025).
51. DePuy Synthes. (2021) FRN-ADVANCED™ Femoral Recon Nailing System: Surgical Technique Guide. Available at: https://p1.aprimocdn.net/jjamp/en/depuy-synthes/surgical-technique-guide/frn-advanced-femoral-recon-nailing-system-(frna)-103715904.pdf (Accessed: 2 October 2025).
52. DePuy Synthes. (2023) TN-ADVANCED™ Tibial Nailing System. Available at: https://www.jnjmedtech.com/en-US/product/tn-advanced (Accessed: 2 October 2025).
53. DePuy Synthes. (2023) TN-ADVANCED™ Tibial Nailing System: Surgical Technique Guide. Available at: https://p1.aprimocdn.net/jjamp/en/depuy-synthes/surgical-technique-guide/tn-advanced-tibial-nailing-system-103711826.pdf (Accessed: 2 October 2025).

54. DePuy Synthes. (2023) RFN-ADVANCED™ Retrograde Femoral Nailing System. Available at: https://www.jnjmedtech.com/en-US/product/rfn-advanced (Accessed: 2 October 2025).
55. DePuy Synthes. (2023) RFN-ADVANCED™ Retrograde Femoral Nailing System: Surgical Technique Guide. Available at: https://p1.aprimocdn.net/jjamp/en/depuy-synthes/surgical-technique-guide/rfn-advanced-retrograde-femoral-nailing-system-surgical-technique-guide-103661491.pdf (Accessed: 2 October 2025).
56. DePuy Synthes. (2023) TFN-ADVANCED™ Proximal Femoral Nailing System. Available at: https://www.jnjmedtech.com/en-US/product/tfn-advanced (Accessed: 2 October 2025).
57. DePuy Synthes. (2022) TFN-ADVANCED™ Proximal Femoral Nailing System: Surgical Technique Guide. Available at: https://p1.aprimocdn.net/jjamp/en/depuy-synthes/surgical-technique-guide/tfn-advanced-proximal-femoral-nailing-system-(tfna)-dsustrm06140109.pdf (Accessed: 2 October 2025).
58. DePuy Synthes. (2023) MultiLoc™ Humeral Nail. Available at: https://www.jnjmedtech.com/en-US/product/multiloc-humeral-nail (Accessed: 2 October 2025).
59. DePuy Synthes. (2021) MultiLoc™ Humeral Nails Surgical Technique Guide. Available at: https://p1.aprimocdn.net/jjamp/en/depuy-synthes/surgical-technique-guide/multiloc-humeral-nails-dsustrm10161136.pdf (Accessed: 2 October 2025).
60. Smith & Nephew. (2022) TRIGEN META NAIL. Available at: https://www.smith-nephew.com/en/health-care-professionals/products/orthopaedics/trigen-meta-nail (Accessed: 2 October 2025).
61. Smith & Nephew. (2023) TRIGEN META NAIL Retrograde Femoral Nail System Surgical Technique Guide. Available at: https://www.smith-nephew.com/en/asset/trigen-meta-nail-retrograde-femoral-nail-system-surgical-technique-qqzvsj (Accessed: 2 October 2025).
62. Smith & Nephew. (no date) TRIGEN MAX Tibia Nailing System. Available at: https://www.smith-nephew.com/en-us/health-care-professionals/products/orthopaedics/trigen-max#overview (Accessed: 2 October 2025).
63. Smith & Nephew. (no date) TRIGEN INTERTAN™ Intertrochanteric Antegrade Nail. Available at: https://www.smith-nephew.com/en-us/health-care-professionals/products/orthopaedics/trigen-intertan (Accessed: 2 October 2025).
64. Smith & Nephew. (no date) TRIGEN META-TAN™ Trochanteric Antegrade Nail. Available at: https://www.smith-nephew.com/en-us/health-care-professionals/products/orthopaedics/trigen-meta-tan-ppl#reference-materials (Accessed: 2 October 2025).
65. Smith & Nephew. (2022) TRIGEN META-TAN™ Surgical Technique Guide. Available at: https://www.smith-nephew.com/en-us/asset/01716-71182129-revb-trigen-meta-tan-surgical-technique-mhe29a (Accessed: 2 October 2025).
66. Smith & Nephew. (2022) TRIGEN Humeral Nail System. Available at: https://www.smith-nephew.com/en/health-care-professionals/products/orthopaedics/trigen-humeral-nail (Accessed: 2 October 2025).
67. Smith & Nephew. (2023) TRIGEN Humeral Nail System: Surgical Technique Guide. Available at: https://www.smith-nephew.com/en/asset/01363-trigen-humeral-nail-surgical-technique-ku7idp (Accessed: 2 October 2025).
68. Zimmer Biomet. (2010) Zimmer Natural Nail System Brochure. Available at: https://www.zimmerbiomet.com/content/dam/zb-corporate/en/products/specialties/trauma/zimmer-natural-nail-znn-system/zimmernaturalnailsystembrochure.pdf (Accessed: 2 October 2025).
69. Zimmer Biomet. (2025) Zimmer® Natural Nail® System. Available at: https://www.zimmerbiomet.com/en/products-and-solutions/specialties/trauma/zimmer-natural-nail-system.html (Accessed: 2 October 2025).
70. Zimmer Biomet. (2024) Zimmer® Natural Nail® System Tibial (Suprapatella) Surgical Technique Guide. Available at: https://www.zimmerbiomet.com/content/dam/zb-corporate/en/education-resources/surgical-techniques/specialties/trauma/zimmer-natural-nail-znn-system/4583.2-US-en-ZNN%20Suprapatellar%20Tibia%20Surgical%20Technique%20Guide.pdf (Accessed: 2 October 2025).
71. Zimmer Biomet. (2023) Zimmer® Natural Nail® System Cephalomedullary Short and Long Nail Implanted with STANDARD Instrument Set Surgical Technique Guide. Available at: https://www.zimmerbiomet.com/content/dam/zb-corporate/en/education-resources/surgical-techniques/specialties/trauma/zimmer-natural-nail-znn-system/4180.1-GLBL-en%20ZNN%20Cephalomedullary%20Short%20and%20Long%20Nail%20Implanted%20with%20STANDARD%20Instrument%20Set%20S.pdf (Accessed: 2 October 2025).
72. Zimmer Biomet. (2024) Zimmer® Natural Nail® System Antegrade Femoral Surgical Technique Guide. Available at: https://www.zimmerbiomet.com/content/dam/zb-corporate/en/education-resources/surgical-techniques/specialties/trauma/zimmer-natural-nail-znn-system/97-2491-002-00%20Rev.%204%20ZNN%20Antegrade%20Surgical%20Technique%20Guide.pdf (Accessed: 2 October 2025).
73. Zimmer Biomet. (2025) AFFIXUS® Natural Nail® Humeral System. Available at: https://www.zimmerbiomet.com/en/products-and-solutions/specialties/trauma/affixus-natural-nail-humeral-system.html (Accessed: 2 October 2025).
74. Zimmer Biomet. (no date) AFFIXUS® Natural Nail® Proximal Humeral System Surgical Technique Guide. Available at: https://www.zimmerbiomet.com/content/dam/zb-corporate/en/education-resources/surgical-techniques/specialties/trauma/affixus-natural-nail-humeral-system/1927.4-GLBL-en-AFFIXUS-Natural-Nail-Proximal-Humeral-System-Surgical-Technique.pdf (Accessed: 2 October 2025).
75. Arthrex, Inc. (no date) Trauma Nails. Available at: https://www.arthrex.com/trauma/nails (Accessed: 2 October 2025).
76. Arthrex, Inc. (2025) Trochanteric Nail System. Available at: https://www.arthrex.com/trauma/trochanteric-nail-system (Accessed: 2 October 2025).
77. Arthrex, Inc. (2025) Trochanteric Nail System Surgical Technique Guide. Available at: https://www.arthrex.com/resources/LT1-000203-en-US/trochanteric-nail-system?referringteam=trauma (Accessed: 2 October 2025).
78. Arthrex, Inc. (2025) Humeral Nail System. Available at: https://www.arthrex.com/trauma/humeral-nail-system (Accessed: 2 October 2025).
79. Arthrex, Inc. (no date) Humeral Nail System Surgical Technique Guide. Available at: https://www.arthrex.com/resources/LT1-000241-en-US/humeral-nail-system?referringteam=arthroplasty_shoulder (Accessed: 2 October 2025).
80. Arthrex, Inc. (2025) Tibial Nail System. Available at: https://www.arthrex.com/trauma/tibial-nail-system (Accessed: 2 October 2025).
81. Arthrex, Inc. (2023) Tibial Nail System Surgical Technique Guide. Available at: https://www.arthrex.com/resources/LT1-000211-en-US/tibial-nail-system?referringteam=trauma (Accessed: 2 October 2025).
82. Arthrex, Inc. (2025) Femoral Nail System. Available at: https://www.arthrex.com/trauma/femoral-nail-system (Accessed: 2 October 2025).
83. Arthrex, Inc. (2023) Antegrade Femoral Nail System Surgical Technique Guide. Available at: https://www.arthrex.com/resources/LT1-000209-en-US/arthrex-antegrade-femoral-nail-system?referringteam=trauma (Accessed: 2 October 2025).
84. Arthrex, Inc. (2023) Retrograde Femoral Nail System Surgical Technique Guide. Available at: https://www.arthrex.com/resources/LT1-000210-en-US/arthrex-retrograde-femoral-nail-system?referringteam=trauma (Accessed: 2 October 2025).

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