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Medical Technology | North America

Spine Survey: Robotic Inflection Very Likely

The spine market appears to be stable if not improving. Robotics is becoming more competitive, but inflection looks increasingly likely in 2020/21.

We conducted an AlphaWise survey of 140 spine surgeons to explore multiple dynamics in spine. See [Survey Respondent Demographics](#) for further details of the survey.

The beginning of a robotic renaissance. Despite structurally lower growth, the spine market remains large (~\$9B) and profitable. For this reason, most major players are demonstrating a renewed commitment through M&A and innovation (see [Exhibit 32](#)) with >\$5bn deployed since mid-2016. Implant development is taking a back seat as companies race to assemble integrated navigation, imaging and robotic platforms. See [Robotics Adoption Growing: Who Stands to Benefit the Most?](#)

Core implant dynamics are stable. Following more consistent market growth in '14-16 of 1.5-2.5%, momentum slowed in 2017 (-150 bps) and again 2018 (-50 bps) which may have reflected pricing or an acceleration in SCS adoption (see [Is SCS Destimulating the Spine Market?](#)). Our respondents see spine procedure growth as relatively stable at ~4% y/y (~2% net of price), consistent with 2018 and our spine model of 1.7% organic growth in '19 (vs. 1% in '18). This is likely risk-adjusted given 2Q market growth of ~2%, implying ~150 bps of momentum improvement (see [Exhibit 31](#) for our spine model).

Battle for share. Each player has adopted a different strategy to grow above market (discussed in [Vendor Share Dynamics](#)), and we see continued share gains in 2020 as most likely for NuVasive (+40 bps) and Globus (+20 bps). We forecast modest share gains for Stryker (+30 bps) during the first full year of K2 commercialization, which is slightly ahead of survey data implying stability. We are more cautious on J&J and Zimmer Biomet prospects into 2020, as J&J (MSe - 60 bps) has lagged peers in innovation and robotics and Zimmer Biomet has taken longer to stabilize LDR and Rosa spine launch was delayed. This is consistent with our survey data suggesting J&J cedes ~1 pt of share and Zimmer Biomet remains stable. Medtronic was the largest discrepancy between our survey (+10 bps) and market model (-40 bps), which is likely predicated on Mazor implant pull-through. If Medtronic share is stable in FY21 it would imply an additional 50 bps to RTG growth, 15 bps to corporate.

The robotic adoption curve is likely steep. Intuitive's da Vinci and Stryker's Mako have showcased the power of robotics. As we suggested in [Is Robotics a Competitive Necessity?](#), integrated technology offerings will be critical to maintaining/growing share. Our survey suggests ~6% of spine procedures are

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currently being done with robotics, which is estimated to triple in three years to ~20%. This closely mirrors the recon robotic prediction in our [2018 Knee Survey](#) (see [Exhibit 13](#)) and Mako's adoption which moved to 30% over 5 years. Mako was alone and there are currently two (Mazor, ExcelsiusGPS) and soon to be four (Rosa Spine 1H20 and NuVasive 1H21) systems on the market which could accelerate adoption. As it relates to existing systems, Mazor X's integration with Stealth removes a key point of differentiation vs. ExcelsiusGPS driving greater comparability consistent with our survey data (see [Which Systems are Receiving the Most Attention?](#)).

- **Globus:** Excelsius placements in 1Q ushered in concerns over the competitive environment but 2Q placements rebounded to ~11 (-2 y/y). At our [Healthcare conference](#), management reiterated 2019 robot placements will grow y/y, despite tracking below 2018 levels to date (25 vs. 17), and acceleration is expected in 2020 where we model 48 placements (+6 y/y) driving 90 bps to growth (with each incremental placement driving 15 bps).
- **Medtronic:** Medtronic US spine growth accelerated 130 bps and 380 bps in 3FQ and 4FQ, with Mazor X Stealth pull-through being a key contributor. 1FQ20 US growth of 2.3% was the highest absolute growth since mid-FY17, although represented 2 pts of momentum deceleration. System disclosure will be limited moving forward given the competitive environment. Medtronic/Mazor robotic share of 70-75% is unlikely maintained but we see the company sustaining majority share in robotic placements in the intermediate term given their commercial leadership, and pull-through dynamics should continue alongside.

What to expect at NASS. The primary focus is the unveiling of NuVasive's robotic system integrated with Pulse. What we know: **(1)** system will be competitive with current robotic offerings, **(2)** first generation will include features beyond pedicle screw placement, **(3)** the system will be technically "open" but enhancements likely create an effective "closed" system, **(4)** commercialization is planned for early 2021 (see [here](#)). Natural comparisons will occur to ExcelsiusGPS and Mazor X Stealth given all three systems will include integrated navigation. Globus and Medtronic should highlight additional planned indications for existing systems (ie interbody cages, deformity, decompression, etc) including timelines. Stryker is likely to provide updates on commercial progress with K2M, which we discuss further below. Si-Bone has signaled surgeon panels should echo enthusiasm for iFuse Bedrock for adult deformity and the associated "trickle down" effect on SI-joint fusion.

Can Stryker spine turn the corner? Stryker's acquisition of K2M (see [Why Spine?](#)) gave investors pause as **(1)** the acquisition was WAMGR dilutive, and **(2)** integration and commercial challenges are common in spine. Our respondent data implies little disruption seen to date (see [Exhibit 24](#)) but 1H19 performance has been sluggish at ~2% pro-forma growth. Management reiterated its commitment for mid-single digit pro-forma growth (4-6%) in 2019 at our [conference](#) last week, with an improvement expected in both 3Q and 4Q. The segment needs to average ~8% growth for the remainder of the year (against tougher comps) to reach 5%. Stryker has spent ~\$2B on spine in the past twelve months to accelerate growth, create an integrated platform, and potentially accelerate robotics with the recently acquired Mobius (see [here](#)). 2020 will be a

key barometer on this strategy as 6% organic growth can drive ~50 bps to corporate growth versus a near zero contribution since 2013.

Waiting for Si-Bone inflection. For SI joint fusion, clinical data was most valued among respondents (see [Exhibit 28](#)). As the only company with randomized controlled data (see [The Other Kind of Fusion](#)), Si-Bone is the clear market leader with ~70% share. Our survey implied a market nearly half our ~\$1bn estimate which reflects the key debate on the stock and need for greater commercial investment. Still, this suggests the market is very underpenetrated at <10-20%. Adoption hurdles are not new and include diagnosis difficulty, payor coverage, physician awareness and reimbursement (see [Exhibit 29](#)). Our thesis centers on investment to drive growth and Si-Bone is set to increase physician training by ~25% and the commercial organization by ~60% this year relative to revenue guidance of 17-20% growth. The publication of 5-year iFuse data, which management stated is a key variable for payors like Cigna at our [Healthcare conference](#) is a potential near-term catalyst. Inflection is less likely into 3Q19 but we remain comfortable modeling ~20% growth in 2019 accelerating to ~24% in 2020.

Survey Respondent Demographics



Primary Research

See what others don't. (1)

Spinal robotic solutions outlook is bullish over the next three years; Medtronic is best positioned, followed by Globus Medical. (2) Adoption of SI joint fusions expected to escalate, despite diagnosis difficulty being the top barrier to broader adoption. Medtronic currently leads competitors in SI joint fusion space with down-to-flat outlook; SI-BONE is next in line with positive outlook. (3) Stable YoY growth of ~4% for instrumented spinal procedures in 2018 and 2019E. DePuy Synthes (J&J) leads overall spinal implant market, but expected to see slight share loss; runner-up Medtronic expected to gain slight momentum.

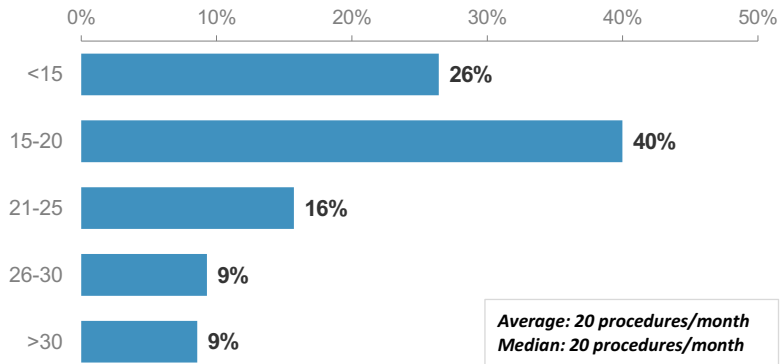
Methodology. Morgan Stanley AlphaWise carried out 140 online interviews in March/April 2019 with orthopedic surgeons in the US who perform at least 10 instrumented spinal procedures in a typical month. 59% of respondents work in academic hospitals and 41% work in community hospitals. 85% of the respondents work in hospitals with at least 300 beds.

Team behind the analysts. AlphaWise Primary Research gathers alternative data and generates unique insights via an innovative analytical and visualization platform.

We surveyed 140 surgeons that specialize in spine surgery. Our survey consisted of an even split between neurosurgeons and orthopedic spine surgeons; however, all respondents specialized in spine surgery. The 140 surgeons we surveyed perform an aggregate of 5.5k surgical procedures per month (~65k per year), with over half of the procedures being instrumented spinal surgeries (i.e., fusions, disc replacements, etc.). The average respondent performs 20 instrumented spinal procedures per month or ~250 annually.

Exhibit 1: Profile of Respondents by Instrumented Spine Procedure Volume

Profile of Respondents: Number of Instrumented Spinal Procedures Per Month (fusions, disc replacements, etc.)

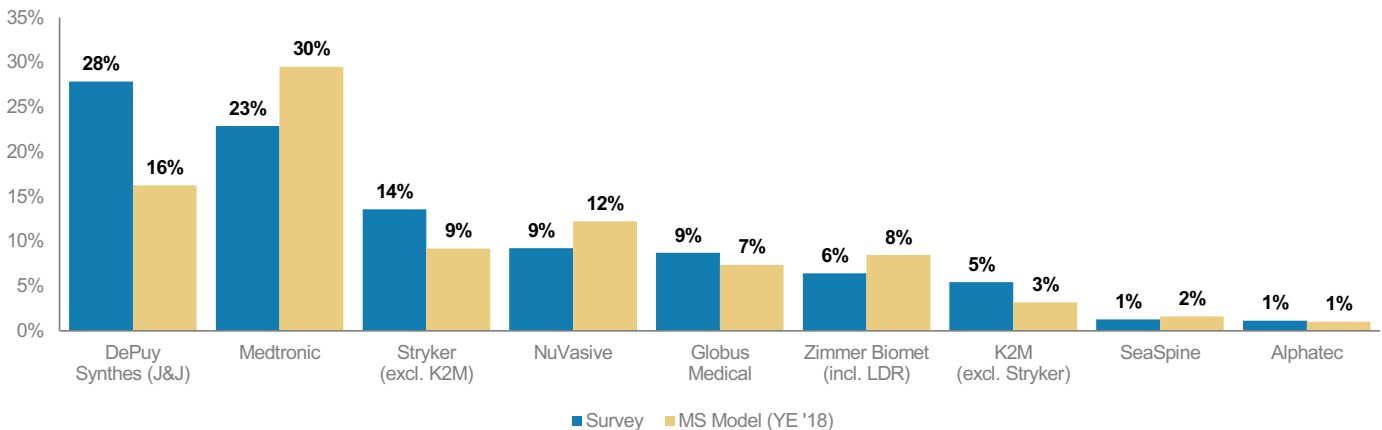


Source: Morgan Stanley Research, AlphaWise

Surveyed spinal implant market share has some variations vs. our model. As of year-end 2018, we estimate that Medtronic has ~30% WW spinal implant share, followed by DePuy Synthes (Johnson & Johnson) at ~16% share. This was the most material difference vs. our survey data as respondents vendor share is skewed toward J&J (~28%) rather than Medtronic (~23%). Additional variations include our survey data overbenchmarking Stryker (ex. K2M; 14% vs. 9% MSe), and to a lesser extent Globus (9% vs. 7% MSe) and K2M (ex. Stryker; 5% vs. 3%). NuVasive and Zimmer Biomet were slightly underbenchmarked vs our model by 2-3 pts. Our spine market model estimates ~11% share from other smaller players in the US, which is significantly higher than our respondent data of ~3% share for other players.

Exhibit 2: Comparison of Spinal Implant Share; Survey vs. MS Model

Spinal Implant Share by Vendor Comparison

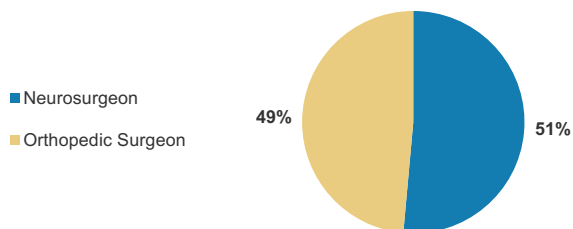


Source: Morgan Stanley Research estimates, AlphaWise

The below charts summarize the profile of our respondents by medical specialty, region, setting (academic, community), and size of hospital (number of beds).

Exhibit 3: Profile of Respondents by Medical Specialty

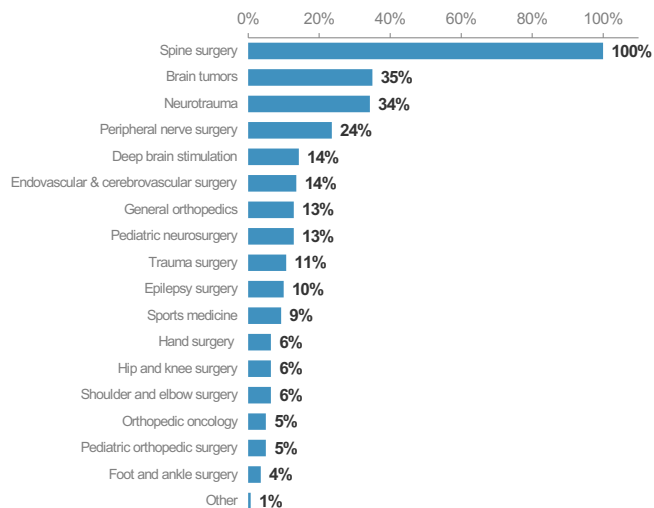
Profile of Respondents: Medical Specialty



Source: Morgan Stanley Research, AlphaWise

Exhibit 4: Profile of Respondents by Medical Subspecialty

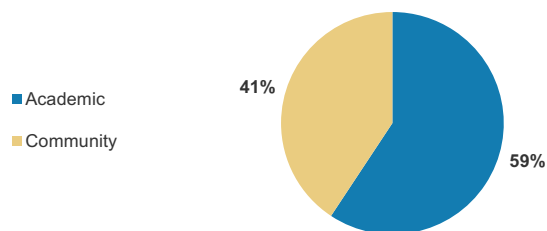
Profile of Respondents: Medical Subspecialty(ies)



Source: Morgan Stanley Research, AlphaWise
 Note: Data adds to >100% due to numerous sub-specialties per surgeon

Exhibit 5: Profile of Respondents by Hospital Setting

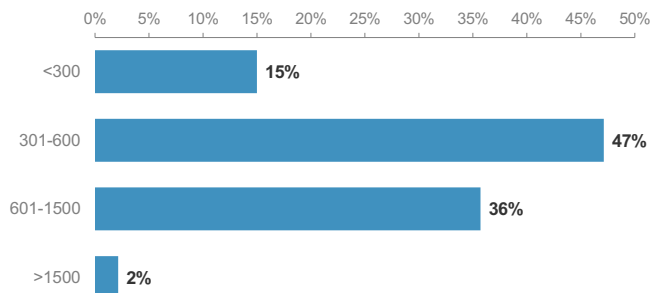
Profile of Respondents: Hospital Type



Source: Morgan Stanley Research, AlphaWise

Exhibit 6: Profile of Respondents by Hospital Size (# of Beds)

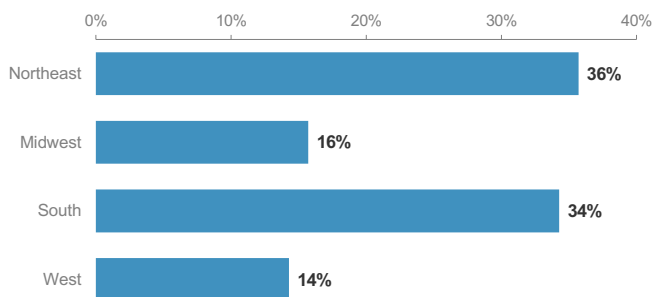
Profile of Respondents: Size of Hospital (# of Beds)



Source: Morgan Stanley Research, AlphaWise

Exhibit 7: Profile of Respondents by Region

Profile of Respondents: Region



Source: Morgan Stanley Research, AlphaWise

Market Stable; Slight Share Shifts Occurring

Spine Procedure Volumes

From the Survey

We surveyed respondents regarding y/y growth in instrumented spinal procedures in 2018 and expected y/y change in 2019. Note the respondent data is based on procedure volume growth and does not incorporate pricing pressure, and thus cannot be viewed as a market growth rate. See [Exhibit 8](#) for corresponding data on spinal procedure volume growth.

What the data said:

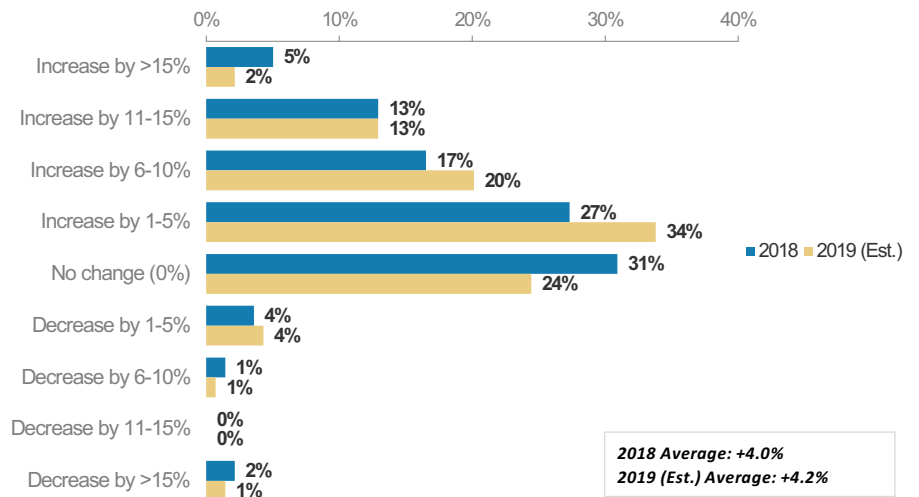
- 2018 spinal procedure volume growth of 4.0% is expected to be stable y/y at 4.2% in 2019.
- 86/139 respondents (~62%) saw an increase in spinal procedure volume in 2018, compared to 96/139 (~69%) expecting procedure volume to grow in 2019.
- 43/139 respondents (~31%) saw no change in spinal procedure volume in 2018, compared to 34/139 (~24%) expecting no change in procedure volume in 2019.
- 10/139 respondents (~7%) saw a decrease in spinal procedure volume in 2018, compared to 9/139 (~6%) expecting procedure volume decline in 2019.

The Takeaway

Market growth expected to be stable. Our respondent data implying ~4% y/y growth in instrumented spine procedures in 2019 is consistent with 2018 growth and relatively in line with company commentary. We note the ~4% procedure growth should not be viewed as a market growth rate as it does not factor in pricing pressure, which has generally been in the low to mid single digits (2-3 pts). We note only ~6% of respondents are projecting a decline in instrumented spinal procedures in 2019, noting the market will likely be at least stable. Our spine model implies a 2018 market growth rate of 1%, and forecasts 2019 market growth of 1.7% (170 bps of comp-adjusted acceleration, see [Exhibit 31](#)) implying 2-3 pts of pricing pressure annually which is generally consistent with company commentary. We note the pure plays (Globus and NuVasive particularly) have cited continued technological innovation as having helped mitigate the pricing pressure in a more material way than the more diversified large caps.

Exhibit 8: Spinal Procedure Volume Growth Projected to be Stable at ~4% y/y

YoY Change Instrumented Spinal Procedure Volume



Source: Morgan Stanley Research, AlphaWise

Vendor Share Dynamics

From the Survey

We surveyed respondents regarding their respective implant share across various spine providers, and how this has changed over the past year, and how they expect share to change over the next one and three years. The data is displayed on an average, equal-weighted basis (as opposed to procedure-weighted). We note given Stryker's acquisition of K2M in August 2018, respondent data could be mixed depending on timing of rep transitions. We note several companies were under/over-represented when compared to our spine model as discussed above (see [Survey Respondent Demographics](#)). See [Exhibit 9](#) for corresponding data on vendor share.

What the data said:

- J&J currently has 28% market share among our respondents, followed by Medtronic (23%), Stryker, ex. K2M (14%), NuVasive (9%) and Globus (9%).
- Over the past year, J&J ceded the most share at 2 pts, followed by Alphatec at 1 pt, whereas Medtronic, Stryker, NuVasive, and Globus each captured 1 pt of share each.
- Share shifts are anticipated to be relatively muted at +/- 1 pt for each vendor over the next three years, but Medtronic, NuVasive, and Globus are each slated to demonstrate gradual increases.

The Takeaway

Companies demonstrating commitment to spine. As we discussed in [NASS: The Quest for Above Market Growth](#), spine is an attractive end-market despite lower market growth, given its size and profitability, and companies remain focused on innovation as it has the ability to drive share gains. Since 2013, share gains have been mainly seen among the spine pure-plays as Globus and NuVasive have captured 4.5 and 2.5 pts of share,

respectively, while Medtronic and J&J have ceded 4.5 and 3.5 pts of share, respectively. Despite this, the large caps have demonstrated a commitment to spine as (1) J&J has stabilized its sales force and is launching new products, (2) Stryker acquired K2M (see [Why Spine?](#)), and most recently Mobius (see [Moving to Where the Puck is with Mobius](#)), (3) Medtronic acquired Mazor (discussed below and inside), and (4) Zimmer Biomet is aiming to stabilize the segment and launching Rosa Spine in early 2020. We outline further details regarding each company's path forward and forecasted share changes below.

Medtronic taking share, likely due to robotic initiatives with Mazor. Our survey data implies Medtronic is the only large cap company to demonstrate share gains over the next one to three years, while J&J, Stryker and Zimmer Biomet are all poised to maintain or cede share. This is likely driven by the company's acquisition of Mazor (see [Why Buy Mazor?](#)) to drive its presence in robotics and further maintain and/or gain share in spine. However we note Medtronic share among our respondents is likely underrepresented at ~23% vs. our estimate at ~33% (see [Exhibit 31](#)). As we will discuss further inside (and here: [NASS: Is Robotics a Competitive Necessity?](#)), the robotic presence in spine represents a key competitive advantage (and likely turns into a necessity) to driving further implant share as Medtronic and Globus have commented on willingness to place robotic systems at a discount (or for free) in exchange for committed volumes. Our survey data implies Medtronic taking 50-75 bps of share over the next three years, which differs from our market model implying ~1 pt of share loss.

J&J likely continues to cede share without a robotic presence. While J&J's spine business has improved in recent quarters to down low single digits (vs. down mid to upper single digits in late 2017 / early 2018), the company has reiterated its commitment to spine and believes that the business is turning a corner with increased product launches and sales force stabilization as our conversations have suggested J&J has lost competitive reps to Globus and NuVasive in recent years. Additionally, we have discussed J&J as coming from behind on the enabling technology front without the presence of a robotic system (knees remains primary focus for Orthotaxy, although could include a spine application in the future). Given the duration of J&J's struggles and limited differentiation, we see limited visibility towards reaching or exceeding market growth in the coming years. Our survey data suggests J&J is expected to continue to cede ~50 bps of share annually, which is consistent with our market model.

Stryker's integration of K2M will be closely monitored; recent Mobius acquisition reiterates commitment to spine. Management has reiterated commitment to mid single digit pro-forma spine growth; however, we note following 2% pro-forma growth in 1H the segment needs to average ~8% growth for the remainder of the year to reach 5% (MSD). As we will discuss further inside (see [Stryker / K2M: Only Time Will Tell](#)), our survey was conducted prior to the cross-selling initiatives that took place in 2Q, thus we believe this to be a key reason why our respondents viewed little disruptions to sales force changes thus far. Management commentary suggests the integration remains on track, although we maintain a more cautious view during the 2019 integration. 2020 onward, we model 5% organic growth for Stryker's spine business, and our survey data suggests Stryker share to be relatively stable over the next three years, consistent with our market model (pro-forma for K2M). Further, the company's recent \$500mn acquisition of Mobius confirms the company's commitment to spine and validates the evolving industry trend toward integrated imaging, navigation, and robotics (see [here](#)). In

addition to acquiring a commercial imaging system with Airo TruCT, Stryker now also controls the future development pipeline of the navigation/robotics platform which can be additive to its current navigation systems in cranial. Previously management has signaled the commercialization of its spine robot is not planned near-term, and while no timeline updates were provided with this acquisition, this deal likely accelerates its time to market.

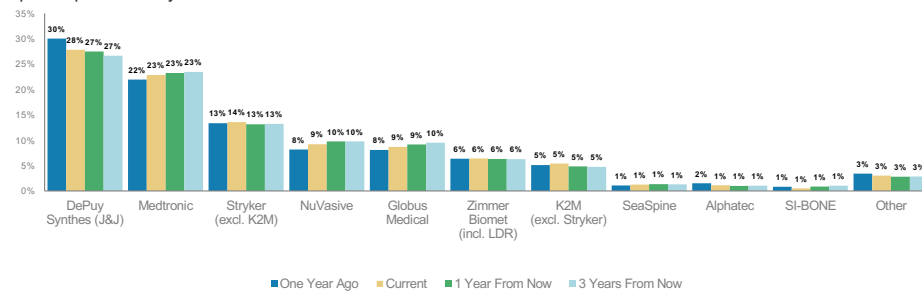
Zimmer Biomet expects spine to gradually improve. Along with other idiosyncratic issues in the business, Zimmer Biomet has worked to integrate the LDR acquisition and move distributors to exclusive agreements. The company will anniversary this headwind later this year, and expects spine to continue to improve with Mobi-C performing well and Rosa Spine launching in early 2020 (slightly pushed out to focus on early commercialization of Rosa knee). However, it is clear the company's spine segment has been challenged and will remain a "show me story" once Rosa Spine launches early next year, although we have discussed spine robotics as becoming increasingly more competitive. Our survey data suggests stagnant share for Zimmer Biomet over the next three years, consistent with our market model.

Robotics is key for Globus, but competitive pressures are increasing. Globus has attributed share gains in spine to competitive rep hires, product launches and innovation, and robotics. Management commentary points to key rep hires coming from the larger spine players, which we see as likely given relative disruptions seen in recent years. Globus has discussed pull-through from ExcelsiusGPS placements as having partly contributed to recent high single digit organic growth in spine (ex. biologics); however, 1Q robotic placements were materially weaker than consensus expected (see [here](#)) due to (1) seasonality / pent-up demand in 1Q18, (2) elongated selling cycle, (3) aggressive marketing tactics from competitors which we will discuss further. However, 2Q placements of ~11 cleared expectations and slightly eased investor concerns regarding a structural challenge near-term. We expect Globus to maintain its technological lead vs. Mazor systems as the company pursues additional indications for the robot (interbody cages, decompression, rod bending, etc.), however monitoring quarterly placement trends will be key to determining whether competitive dynamics will be a significant structural headwind moving forward. Our survey data suggests Globus gaining ~1 pt of share over the next three years, consistent with our market model.

Investor Day outlined strategy for NuVasive; robotics at NASS will be a key focus. New CEO Chris Barry has posted two solid quarters thus far into his role, effectively de-risking 2019 guidance. The [Investor Day](#) in August set forth achievable targets for NuVasive through 2024 that included 5-7% topline growth (we estimate 4-6% organic) and incorporated "prudent" targets for the respective segments. Spine growth CAGR of ~5% will be led by continued adoption of minimally invasive procedures, X360 traction, and further penetration of core XLIF franchises. US Surgical Support CAGR of ~4% only includes ~\$50mn of incremental revenue over the next five years, which appears conservative given Pulse and robotics will be reported here (discussed further in [Could Pulse Make a Difference?](#)). The upcoming robotics event at NASS will be a key focus item to outlining the strategy for robotics adoption over the next 5-years, and our conversations suggest the system is expected to be competitive with others on the market, and incorporate more than just pedicle screw placement. Our survey data suggests NuVasive gaining ~1 pt of share over the next three years, consistent with our market model.

Exhibit 9: Spinal Implant Share Dynamics

Spinal Implant Share by Vendor



Source: Morgan Stanley Research, AlphaWise

Prior Authorizations & Denials

From the Survey

We surveyed respondents regarding their experience with payors relating to prior authorization programs and coverage denials in spine surgery. In an effort to control costs, in recent years payors have adopted prior authorization programs before covering various spine surgery procedures, which decreased physicians' ability to obtain reimbursement coverage. We asked respondents how this dynamic changed in 2018, and how they anticipate the discussions/payor pushbacks to change in 2019. We also asked respondents to provide qualitative commentary based on the answers provided. See [Exhibit 10](#) for corresponding data on insurers use of prior authorization/denials.

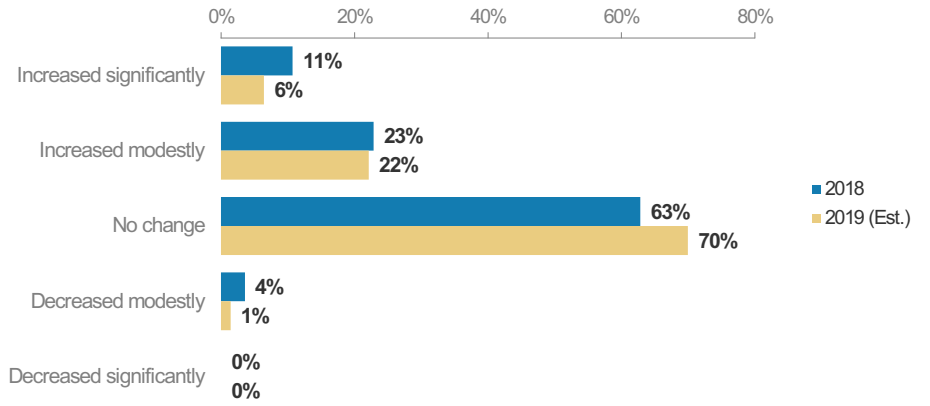
What the data said:

- 63% of respondents did not see a material change of insurance companies use of prior authorizations or denials in 2018, and 70% do not expect a change in 2019.
- 34% of respondents stated insurance companies use of prior authorizations / denials increased y/y in 2018, which compares to 28% for 2019.

Insurance companies use of prior authorizations and / or denials is expected to be stable. Given rising healthcare costs, many insurers have adopted requirements of prior authorizations in recent years (alternative treatments, various consultations, etc) prior to covering spinal procedures. In turn, this hindered physicians' abilities to obtain consistent reimbursement coverage for procedures and as such certain procedures saw decreased volumes which impacted provider implant sales. However, our diligence has suggested there has been no material change in prior authorization or denial patterns, which our survey data supports as 70% of respondents do not expect patterns to change in 2019. When subsequently asked about specific details relating to procedures and insurers, responses were widely spread citing most of the larger commercial insurers across various types of fusion.

Exhibit 10: Expected Change in Insurance Payor Prior Authorization/Denials

YoY Change in Insurance Companies' Use of Prior Authorization and/or Denials



Source: Morgan Stanley Research, AlphaWise

Robotics Adoption Growing: Who Stands to Benefit the Most?

Robotic Systems in Spine Surgery

From the Survey

We surveyed respondents regarding whether their hospital / facility currently has a robotic system for spine and the current proportion of spinal procedures done with a robotic system to get a sense of the forecasted adoption ramp. We defined "robotic system" as one of the following: Mazor X, Mazor X Stealth, Mazor Renaissance, ExcelsiusGPS, Rosa for Spine, and Other. The only "Other" response recorded was BrainLab. Note our survey was conducted prior to Stryker's acquisition of Mobius/Cardan. Regarding percent of spinal procedures performed with a robotic system, we split this data between all respondents, and current robotic users. See [Exhibit 11](#) and [Exhibit 12](#) for corresponding data on robotic systems in spine surgery.

What the data said:

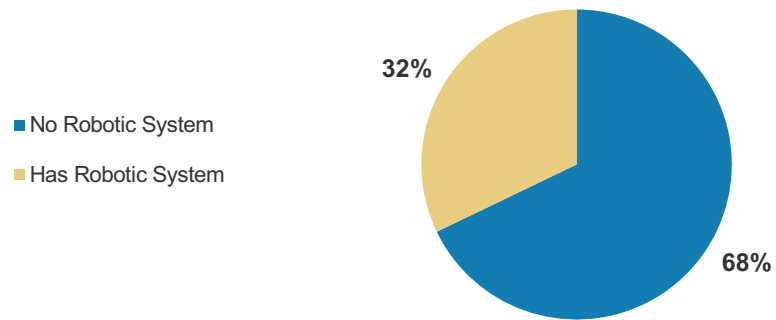
- 45/140 respondents (~32%) currently have a robotic system in their hospital / facility.
- Across all respondents, ~6.2% of all instrumented spine procedures are being done with robotics, up from 4.1% one year ago and forecasted to grow to 11.6% and 20.7% one and three years from now, respectively.
- Among current robotic users, ~13.8% of all instrumented spine procedures are being done with robotics, up from 8.7% one year ago and forecasted to grow to 18.3% and 25.9% one and three years from now, respectively.

The Takeaway

Clear interest in robotics in spine; adoption curve may look similar to robotics in recon.

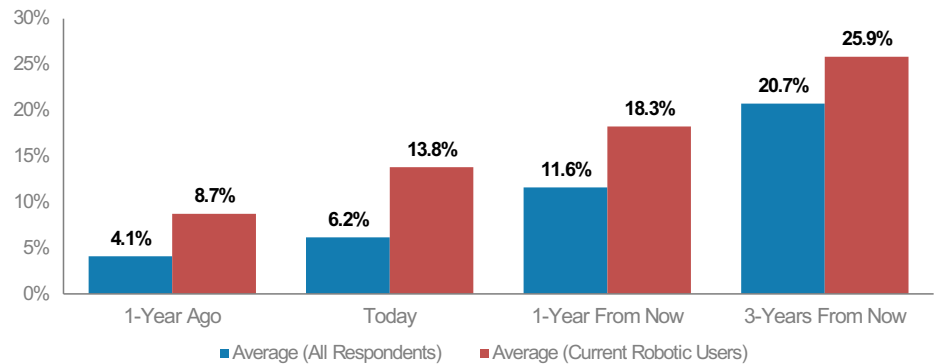
We have discussed the value of robotics in orthopedic and spine surgery leading to more consistent, predictable outcomes for patients as automation is incorporated. In [Exhibit 12](#), our respondents estimated the percent of spine procedures being done on robotics (currently ~6%), which is projected to triple to ~20% in three years. This nearly mirrors the projected trajectory for robotics in knee surgery in our [2018 Knee Survey](#), which stated ~8% of TKAs are currently done with robotics (survey deployed mid-2018), projected to triple to ~25% in three years (see [Exhibit 13](#)). However, as we will discuss further, the nuances are slightly different on the competitive front given Mako was several years ahead of other robotic systems in orthopedics and basically penetrated the market on its own to start. Robotics in spine is slightly different being mainly a two player market (Medtronic/Mazor and Globus/Excelsius), with Rosa Spine as the third player having received approval for spine, and NuVasive as the fourth with Pulse integrated with robotics as the company plans to showcase its robotics offering at NASS. Further and as discussed earlier, Stryker's recent acquisition of Mobius/Cardan validates the trend of integrated imaging, navigation and robotics (see [Moving to Where the Puck is with Mobius](#)).

Exhibit 11: ~1/3 of respondents have a robotic system in their facility
 Respondents with Robotic Systems in Hospital (Currently)



Source: Morgan Stanley Research, AlphaWise

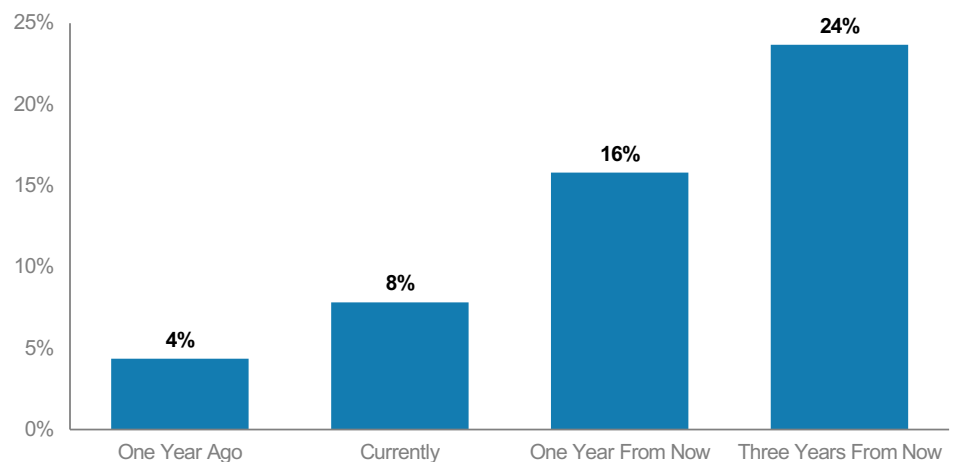
Exhibit 12: Robotic Spine Procedures Anticipated to Grow
 Percent of Instrumented Spine Procedures Performed With Robotics



Source: Morgan Stanley Research, AlphaWise

Exhibit 13: Comparison: Robotic Knee Procedure Growth Forecast (From [Knee Survey: Robotic Inflection on Horizon; SYK Remains the Winner](#))

Robotic Solutions Share of Total Knee Arthroplasty Procedures



Source: Morgan Stanley Research, AlphaWise

Which Systems are Receiving the Most Attention?

From the Survey

We surveyed respondents regarding whether their hospital / facility currently has a robotic system. We also inquired whether their facility was considering purchasing a robotic system in the next twelve months, to which we subsequently analyzed the data to display results for (i) all respondents, (ii) those that currently have a robotic system, and (iii) those that do not currently have a robotic system. From there, among those that are considering purchasing, we asked respondents how many systems are being evaluated, and which ones. Please note that several respondents may not be directly involved with purchasing decisions, and therefore may not have direct information as to whether a system is being considered (hence we included a "Don't Know" response). Our survey was also deployed prior to Stryker's acquisition of Mobius/Cardan. See [Exhibit 14](#), [Exhibit 15](#), [Exhibit 16](#), [Exhibit 17](#), [Exhibit 18](#), [Exhibit 19](#), and [Exhibit 20](#) for corresponding data on robotic systems in hospitals and potential purchasing decisions.

What the data said:

- 22 respondents (16%) currently have a Mazor X system, followed by 13 respondents (9%) having an ExcelsiusGPS.
- 29 respondents (21%) currently have a Medtronic robotic system at their facility (Mazor X, Mazor X Stealth, Mazor Renaissance).
- In the next twelve months, 35% of all respondents are considering purchasing a robotic system, 42% are not, and 23% are unsure.
 - Among those that currently have a robotic system (n=45), 38% are considering purchasing another, 42% are not, and 20% are unsure.
 - Among those that do not currently have a robotic system (n=95), 34% are considering purchasing one, 42% are not, and 24% are unsure.
- Of the 49 respondents considering purchasing a robotic system in the next twelve months, 24 (49%) are considering only one system, 17 (35%) are considering two systems, 5 (10%) are considering 3+ systems, and 3 (6%) are unsure.
- Mazor X Stealth is the most widely considered robot (49% considering purchasing), followed by ExcelsiusGPS (39%). Note 36/49 respondents (73%) are considering purchasing a Medtronic/Mazor system.

The Takeaway

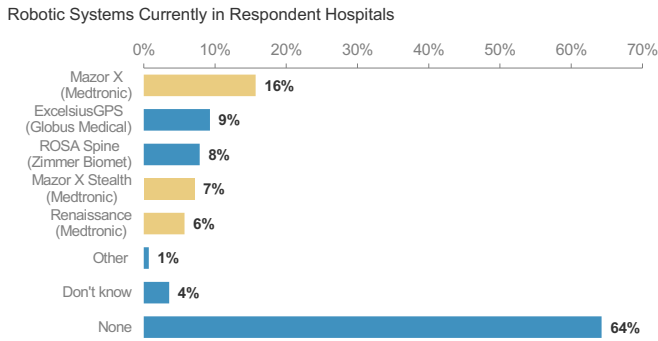
Competitive environment rising; hospitals likely to evaluate multiple systems. As hospitals have continued to control costs, evaluating options for larger capital purchases becomes an obvious route, and with more than one spinal robotic system on the market currently (with 1-2 more coming this year), the selling strategies have been more of a factor. As we will discuss further below, both Mazor X Stealth and Globus are now viewed as more similar systems, and much of the decision making may come down to bundling and cost. As such, we expect hospitals to evaluate multiple systems and financing options. This view is supported by (1) our survey data below suggesting ~50% of centers are evaluating more than one system, and (2) Globus 1Q19 commentary stating the increased competitive environment in robotics has caused an elongated selling cycle (see [here](#)).

Mazor likely maintains majority share. Commentary on Medtronic's recent earnings calls suggest the company has 70%+ market share in spinal robotics, with 3.5x the amount of robots placed as the closest competitor (ExcelsiusGPS). We estimate Globus to have placed 70-75 systems, implying an install base of ~250 for Mazor. Although we note Medtronic will no longer be disclosing placements moving forward for competitive purposes (see [1FQ20 Device Derivatives](#)). Among our respondents, Medtronic systems (Mazor X Stealth, Mazor X, Mazor Renaissance) hold a ~60% share, vs. Excelsius at ~20%. We see intensive marketing tactics and bundling as a key component of Medtronic's ability to maintain share (see [Clear Signs of Implant Bundling](#)); however, since launch in late 2017, we estimate Globus to have taken 15-25 pts of share from Mazor. Notably, of the 49 respondents evaluating robotic systems for purchase over the next twelve months, 36 (75%) are evaluating a Medtronic system vs. 39% evaluating Excelsius.

Globus has been most vocal regarding additional applications. Prior to Mazor's integration of Medtronic's Stealth, our diligence has suggested that integrated navigation was a key differentiator between Mazor X and Globus. However, following the integration, the systems are viewed as much more similar as the differentiation is very nuanced (strength of arm, workflow, mobility of system). Beyond this, Globus has discussed additional applications planned for Excelsius that include (1) interbody cages (recent approval, see [here](#)), (2) deformity module integrating SurgiMap (filing for approval late 2019), (3) cranial application (filing for approval late 2019), (4) rod insertion / bending (late 2019 / early 2020 submission), and (5) decompression / discectomy (beyond 2020). While Globus has been most vocal regarding planned upgrades and indications, we understand Medtronic is working on similar pursuits to incorporate: interbodies and powered instruments, decompression, rod bending, and further planning and navigation upgrades, while planned timing is unclear. Zimmer Biomet has not specifically commented on future applications / timing, however our conversations suggest the company will likely pursue additional indications in the future.

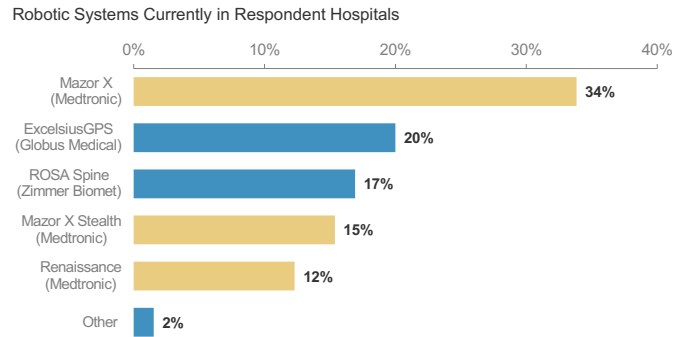
Rosa spine presence could reflect upgrades from cranial application. Zimmer Biomet received approval for Rosa Spine at the end of March 2019, and we were surprised to learn that 11 respondents (8%) claimed to have the Rosa system for spine in early 2Q when our survey was deployed. While possible that Zimmer Biomet placed these de novo spine systems, it is much more likely to reflect upgrades from centers that have the Rosa system for cranial application as our conversations suggest the upgrade process can be done relatively quickly. Further, Zimmer Biomet has been vocal that Rosa Spine launch is set for early 2020 as the company focuses on early commercialization efforts of Rosa Knee. Our survey data suggests 7/49 respondents (~14%) that are considering a robot are considering Rosa spine. We do not view this as surprising given the system only recently received approval and Zimmer Biomet plans to begin more actively selling in early 2020.

Exhibit 14: Robotic Systems in Hospitals



Source: Morgan Stanley Research, AlphaWise
 Note: Data adds to >100% given hospitals can have >1 system

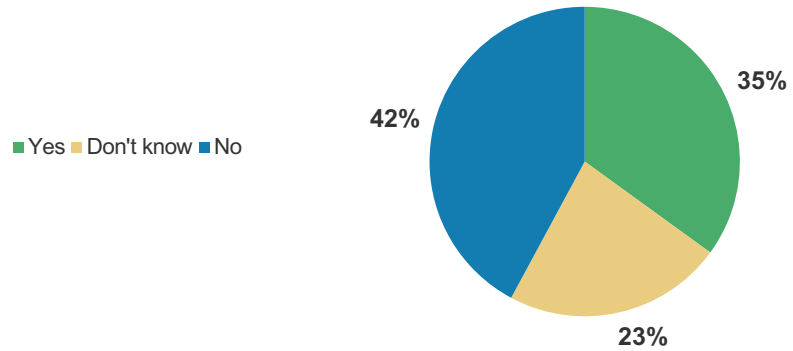
Exhibit 15: Robotic Systems in Hospitals (Among Those Who Have a System)



Source: Morgan Stanley Research, AlphaWise

Exhibit 16: Hospitals Considering Purchasing a Robotic System

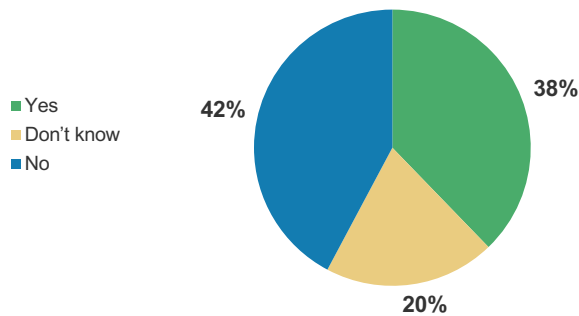
Is Your Hospital Considering Purchasing a Robotic System in the Next Twelve Months?



Source: Morgan Stanley Research, AlphaWise

Exhibit 17: Of those that have a robotic system...

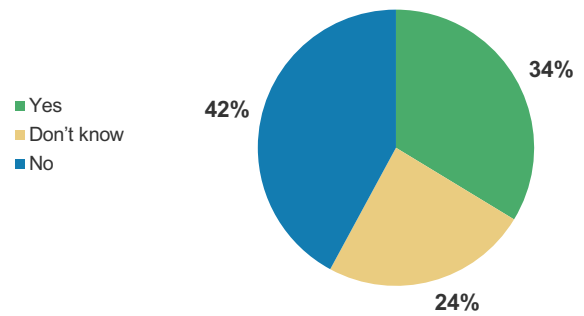
Of those that **currently have** a robotic system (45 respondents)....are you considering another?



Source: Morgan Stanley Research, AlphaWise

Exhibit 18: Of those that do not have a robotic system...

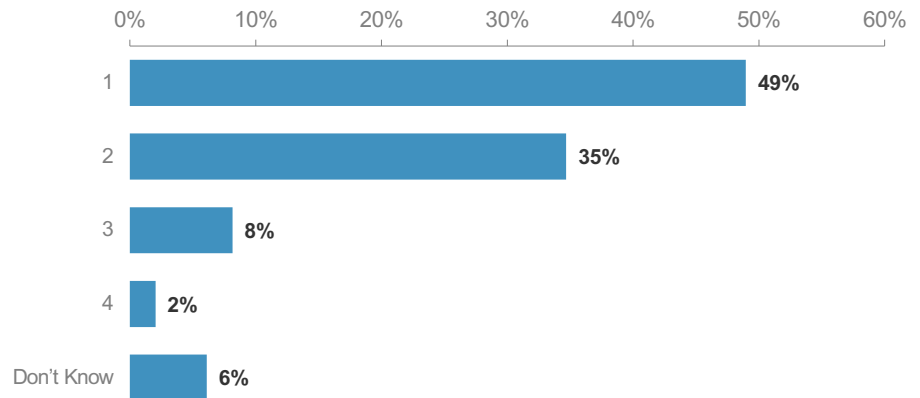
Of those that **do not currently have** a robotic system (95 respondents)....are you purchasing one?



Source: Morgan Stanley Research, AlphaWise

Exhibit 19: Respondents are mainly considering 1-2 systems

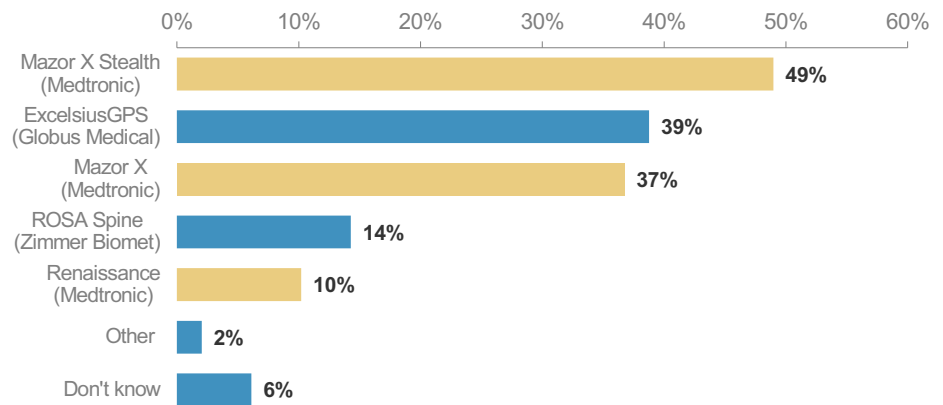
How many different systems are you currently evaluating?



Source: Morgan Stanley Research, AlphaWise

Exhibit 20: Which Systems are Being Evaluated?

Of those that are considering purchasing a robot (49 respondents)...which are you currently evaluating?



Source: Morgan Stanley Research, AlphaWise
 Note: Data adds to >100% given several respondents are evaluating more than 1 system

Clear Signs of Implant Bundling

From the Survey

We surveyed respondents regarding experience with Medtronic and Globus as it relates to sales strategy. Our conversations and company commentary has suggested that Medtronic and Globus have been offering free or discounted robotic systems in exchange for committed implant volumes in an attempt to maintain or capture share. Responses were tracked from respondents who (1) currently have a Mazor X, Mazor X Stealth, and/or ExcelsiusGPS, and (2) are evaluating purchasing Mazor X, Mazor X Stealth, and/or ExcelsiusGPS. Number of respondents who currently have or are evaluating Mazor X or Mazor X Stealth was 53, vs. 29 for ExcelsiusGPS. See [Exhibit 21](#) and [Exhibit 22](#) for corresponding data regarding implant bundling.

What the data said:

- 27/53 of respondents (~51%) stated that Medtronic has offered a Mazor system at a discounted or no cost in exchange for committed implant volumes

- 10/29 of respondents (~35%) stated that Globus has offered an ExcelsiusGPS system at a discounted or no cost in exchange for committed implant volumes
- 5/53 respondents (~9%) stated that Medtronic has not offered any bundling options
- 8/29 respondents (~28%) stated that Globus has not offered any bundling options
- 38-40% of respondents answered "Don't Know / Not Applicable," likely due to the respondent not specifically being involved in purchasing decisions

The Takeaway

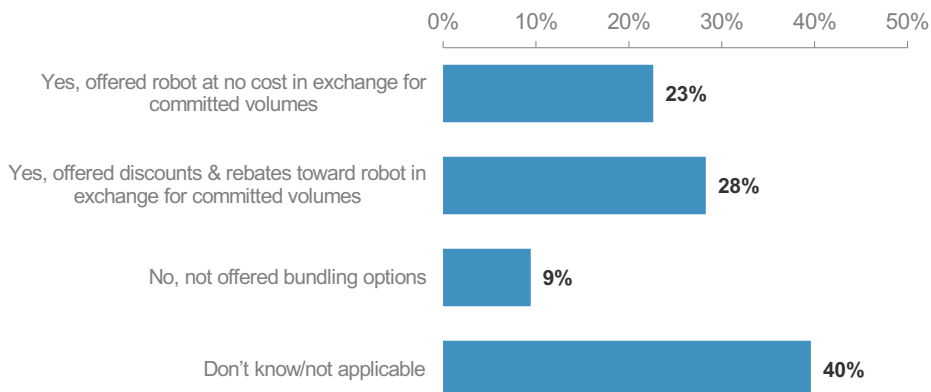
Medtronic is intensively offering bundling solutions. Within our survey, ~50% of respondents cited Medtronic has offering free to discounted robotic systems in exchange for committed volumes. However, this includes 40% of respondents who answered "Don't know"; thus adjusting for this to include only responses with a definitive answer this equates to ~85% claiming they were offered bundling solutions. This closely mirrors Medtronic's commentary on the 4FQ earnings call stating 21 of the 25-26 (80-85%) Mazor sales in 1CQ were placed with a usage based agreement. Additionally, the company has cited many of the placements and usage based agreements were targeted at competitive accounts where Medtronic is underrepresented in share. As we discuss below, Globus cited lighter 1CQ robotic placements partly due to intense marketing tactics by competitors creating a longer selling cycle (see [here](#)), which in part is likely attributable to the bundling solutions offered by Medtronic.

Globus has signaled a willingness to offer bundling; however, it lacks the scale of Medtronic. Prior to Excelsius, Globus typically did not sell larger capital equipment and operated as a traditional pure-play spine company. Prior to Medtronic's acquisition of Mazor, the selling strategy(ies) of the robotic systems were not entirely a debate, however when Medtronic could leverage its share and scale, selling strategies were adjusted. Globus has recently discussed a willingness to offer discounted (or free) systems in exchange for committed volumes, however our survey data supports our view of this being done to a lesser extent given the company lacks the scale of Medtronic. Rather than compete on bundling (which both companies are now doing), Globus has modified its positioning to differentiate ExcelsiusGPS clinically vs. Mazor and focus on the clinical benefit and future applications.

Early signs of pull-through being seen. While there is value in initial capital sales, we have repeatedly discussed the longer-term implant pull-through value of robotics as underappreciated. While our survey data was inconclusive on this front, both Globus and Medtronic have attributed some of the recent performance in spine to higher case volumes and additional implant share, particularly in competitive accounts.

Exhibit 21: ~50% of respondents stated Medtronic has offered usage based contracts (n=53)

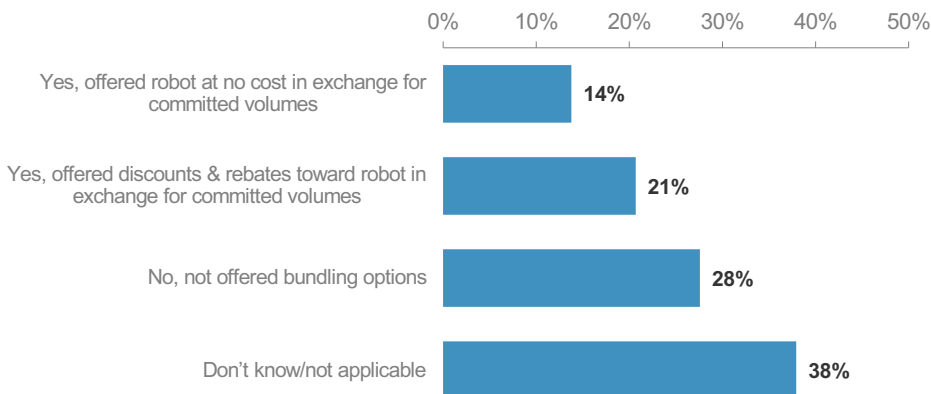
Medtronic (Mazor): Robot & Implant Bundling Offers



Source: Morgan Stanley Research, AlphaWise

Exhibit 22: Globus is also offering bundling contracts, however less intensively than Medtronic (n=29)

Globus (ExcelsiusGPS): Robot & Implant Bundling Offers



Source: Morgan Stanley Research, AlphaWise

Could Pulse Make a Difference?

From the Survey

We surveyed respondents regarding their (1) familiarity of NuVasive's Pulse system, and (2) whether the pending development of Pulse (with a robotics application) will affect planned purchasing decisions for robotics. We tracked responses from all physicians, and subsequently calculated the average share among those respondents in each category to get a sense if there was a skew to NuVasive loyalist accounts, or accounts that do not have a significant NuVasive share. See [Exhibit 23](#) for corresponding data on NuVasive's Pulse platform as it relates to purchasing decisions.

What the data said:

- 45/140 respondents (32%) would like to review NuVasive's Pulse platform prior to making a purchasing decision on robotics. These respondents averaged ~14% NuVasive implant share.

- 31/140 respondents (22%) stated the pending development of NuVasive's Pulse platform will not impact their purchasing decision on robotics. These respondents averaged ~11% NuVasive implant share.
- 64/140 respondents (46%) are not aware of NuVasive's Pulse platform. These respondents averaged ~5% NuVasive implant share.

The Takeaway

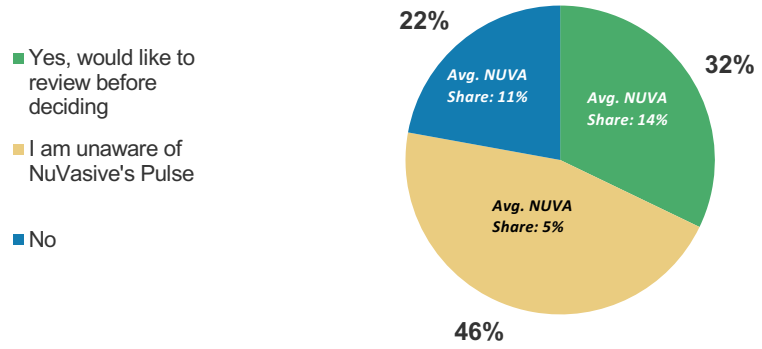
What is NuVasive's Pulse? Pulse is NuVasive's ecosystem for capital equipment and software to improve spine procedure workflow. Pulse incorporates a number of the company's prior technologies including NUVAMap, Bendini (rod bending), LessRay (imaging with reduced radiation), and Neuromonitoring, while adding 2D and 3D navigation and imaging. The system was unveiled at NASS 2018, and launched in early July. Management has framed the value proposition of the system as (1) an integrated system to improve spine procedure workflow and reduce variation of outcomes, (2) the ability to use the system in a majority of spine procedures, and (3) more cost effective than competitive robotics offerings (Pulse at ~\$500k vs. robotics at ~\$1mn). While the system does not currently have a robotics application, management has widely discussed the plans for automation to be incorporated as we will discuss below.

Robotics: what do we know thus far? NuVasive is set to unveil its robotics application integrated with Pulse at NASS in late September. While details have been minor and incremental to date, we have learned that (1) management is confident the offering will be competitive with initial systems on the market, (2) it will include a combination of both internal and external development, (3) the first generation of the system will include offerings beyond pedicle screw placement, and (4) the system will be technically an "open" platform but enhancements likely drive an effective "closed" system. The selling strategy is likely comparable to standalone Pulse and will remain flexible (outright sales, leases, etc). At our [Healthcare conference](#), we learned from CEO Chris Barry that the regulatory process is likely to take place in 2020, with commercialization planned for 2021.

Framing relative contribution of Pulse & robotics. At NuVasive's [Investor Day](#) in August, management outlined 5-year growth targets for each segment. US Surgical Support targets included \$50mn in incremental revenue from '19-24, which we see as conservative given Pulse and robotics revenue will be reported here. Assuming flat to 1% growth for the remainder of the portfolio, this implies Pulse and robotics contribution of ~\$40mn over the LRP which we see as conservative given (1) Pulse was launched this year and is compatible with the majority of spine procedures, and (2) management agreed that the ramp/trajectory of robotics can be viewed as a decent proxy. Management has reiterated projections for Pulse and robotics are modest throughout the LRP. For reference, 25-50 incremental Pulse placements in 2020 would drive an additional 80-160 bps to total growth (assuming 50/50 outright vs. usage-based mix). It is unclear what management plans to set the robotics ASP as; however, assuming \$1.25mn at a 50/50 outright vs. usage-based mix, 40 systems can drive ~3 pts to growth in 2022, or nearly the entire of the ~\$40mn discussed.

Exhibit 23: ~1/3 of respondents would like to review PULSE before deciding on a system

Does the pending development of NuVasive's Pulse platform for affect your purchasing decision for robotic solutions?



Source: Morgan Stanley Research, AlphaWise

Stryker / K2M: Only Time Will Tell

From the Survey

We surveyed respondents regarding any potential changes they have seen or noticed in sales rep relationships or product offerings following Stryker's acquisition of K2M in August 2018. Responses were tracked and analyzed to include only respondents with >0% share for Stryker and/or K2M (80 respondents or ~57%), however we note that only 18 respondents (~13%) have >0% share for both Stryker and K2M. See [Exhibit 24](#) for corresponding data on Stryker and K2M rep changes.

What the data said:

- 9/80 respondents (11%) stated their K2M rep services both Stryker and K2M products (Stryker rep is no longer involved).
- 12/80 respondents (15%) stated their Stryker rep services both Stryker and K2M products (K2M rep is no longer involved).
- 21/80 respondents (26%) stated reps remain separate, however reps can now offer both Stryker and K2M products.
- 38/80 respondents (48%) have not seen a change in reps or implants offered by either Stryker or K2M rep.

The Takeaway

Why spine? Stryker announced the acquisition of K2M in August 2018 for ~\$1.4bn (see [Why Spine?](#)). We discussed historical challenges with spine acquisitions given sales force integration disruptions; however, we were slightly more optimistic on this deal given **(1)** <10% sales force overlap between the two companies, **(2)** K2M provides a refresh of Stryker's deformity portfolio, and **(3)** K2M CEO Eric Major is leading the new division. Our M&A analysis suggested defensible returns of 7-8% by 2022.

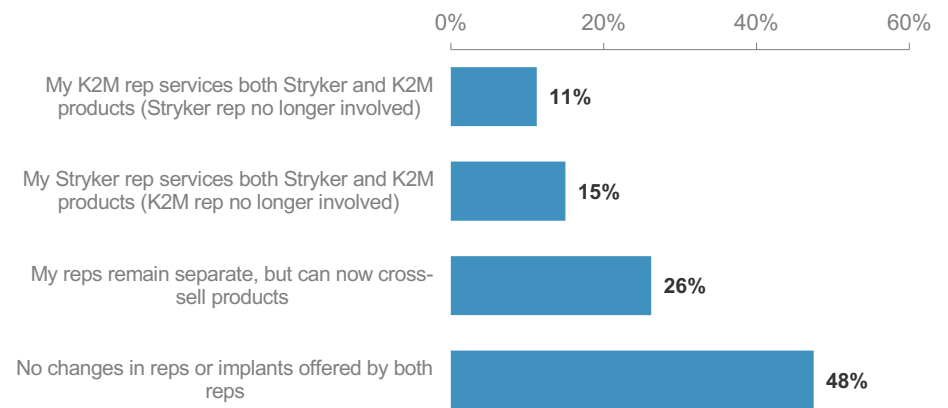
Survey suggests little disruption to date; however, that could be a factor of timing. Our survey data implies little disruption thus far in the integration process as ~50% of respondents have not noticed any changes in reps or products, with another 25% seeing no change in reps, only increased breadth of product offered. However, this could be a factor of timing as our survey was deployed in late 1Q and was likely too early in the integration to make an adequate judgement. During our CEO meeting (see [here](#)), management admitted integration challenges were seen in 1H, although these were fully anticipated. We previewed spine weakness ahead of 2Q results as the bulk of the cross-training / selling was set to occur in 2Q, and results of ~2% pro-forma growth in 2Q did not signal an improvement vs. 1Q.

We remain cautious on Stryker's spine during the integration. Management has reiterated commitment to mid single digit pro-forma spine growth in 2019, however we note following 2% pro-forma growth in 1H the segment needs to average ~8% growth for the remainder of the year to reach 5%. While 1H results were not alarming, we

maintain a more cautious view. Recent commentary has suggested the overall integration remains on track with cost synergies moving ahead of plan, but 3Q results will provide a more thorough read-through regarding execution a the bulk of the sales force integration and cross-selling began in 2Q.

Exhibit 24: Half of respondents have seen no change in Stryker/K2M sales rep dynamics

Stryker / K2M Rep Relationship Changes



Source: Morgan Stanley Research, AlphaWise

SI Joint Fusion

From the Survey

We surveyed respondents on various dynamics in sacroiliac joint (SI joint) fusion. All respondents were asked (i) opinions on market sizing as it relates to % of lower back pain attributable to the SI joint, (ii) monthly procedure volume, (iii) adequate physician reimbursement rates, (iv) barriers to adoption. Subsequently, among the 75 that currently perform SI joint fusion, we inquired about (i) approximate market share among vendors, (ii) most important considerations when choosing an implant provider. See [Exhibit 25](#), [Exhibit 26](#), [Exhibit 27](#), [Exhibit 29](#), [Exhibit 28](#), and [Exhibit 30](#) for corresponding data on SI joint fusion. We discuss this market in great detail in our Si-Bone initiation of coverage (see [The Other Kind of Fusion](#)).

What the data said:

- 75/140 (54%) of respondents currently perform SI joint fusion, which is expected to grow to 91 (65%) one-year from now and 98 (70%) three-years from now.
- Respondents view an average of ~11% of lower back pain as attributable to the SI joint, with 78% responding within the range of 10-20%.
- Respondents perform an average of 2.5 SIJF procedures per month, up from 1.8 one-year ago, and expected to grow to 3.7 and 5.6 per month one and three years from now, respectively.
- Clinical data is the most important consideration among respondents when choosing a provider of SIJF implants, followed by ease of procedure and cost/economics.
- Diagnosis difficulty was the #1 barrier to adoption among our respondents, followed by non-surgical alternatives being equally effective and physician training.
- Respondents on average view \$1,225 as an adequate level of physician reimbursement for minimally invasive SI joint fusion, with \$1k as the median (note current physician reimbursement ~\$715).

The Takeaway

Respondents view the market for SI joint fusion as smaller than our estimate. On average, our survey respondents believe ~11% of lower back pain is attributable to the SI joint, roughly half of our 22.5% estimate and lower than the 15-30% range discussed in published literature. Unlike lower back pain in general, the esoteric nature of the sacroiliac joints to the average patient makes it slightly more difficult for patients to identify the source of pain, thus more challenging to estimate the true prevalence of SI joint pain. Our respondents market estimate was not overly surprising to us, as this has been a key debate in the adoption views of SI joint fusion. Our market model (assuming 22.5% of LBP is attributable to the SI joint) implies a market opportunity of 900k-1mn SI joint fusion procedures per year or a ~\$1bn TAM. Using this estimate, our model implies

~10% market penetration. If we adjust to cut our market estimate in half (consistent with our survey), the new implied TAM would drop to ~\$500mn to which the market would be ~20% penetrated. See our Si-Bone [Initiation of Coverage](#) for a more detailed breakdown of our market assumptions.

Irrespective of TAM, the SI joint fusion market is growing rapidly. Among all respondents, SI joint fusion procedures are projected to grow at a ~31% CAGR over the next three years. As the market leader with 70-80% market share (underrepresented in our survey), Si-Bone stands to benefit the most given (i) significant investment in market development via surgeon training and education, (ii) sales force hires, and (iii) clinically differentiated implant as we will discuss below. Our respondent data supports our thesis of market growth and inflection leaving us comfortable in Si-Bone's topline acceleration, growing at a ~24% CAGR over the next three years. As we have discussed (see [here](#) and [here](#)), we expect 2H19 to be a more material inflection point for the company as (1) sales rep hires from 2H18 / 1H19 begin to contribute, (2) there is continued focus on surgeon education expanding active surgeons by 100 y/y, and (3) incremental payor coverage decisions.

Clinical data as most important vendor consideration significantly favors Si-Bone. Si-Bone's patented triangular implant, iFuse, is backed by two randomized trials and multiple peer review studies in which iFuse was shown to significantly decrease pain vs. non-surgical management and is the only implant for SIJF that has supporting clinical evidence in randomized trials. This data arsenal alongside the support of leading clinical societies (NASS, ISASS, etc.) has helped catalyze momentum in building a significant foundation of ~260mn covered lives, and obtaining reimbursement coverage from the larger commercial payors is the next frontier, which we have discussed is likely catalyzed by five-year follow-up data later this summer / early fall. We are unaware of any competitors engaging in clinical studies for their screw implants, and are thus comfortable with Si-Bone maintaining majority market share.

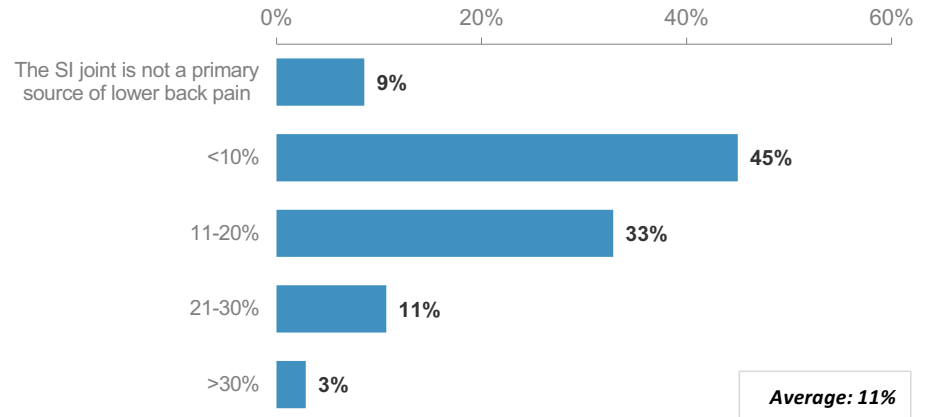
Various hurdles preventing broad-based adoption. Our extensive diligence has suggested many physicians are unwilling to routinely perform SI joint fusions for a variety of reasons stemming from lack of surgeon training and awareness, to inadequate reimbursement coverage. Our respondents view diagnosis difficulty as the primary barrier to broad based adoption, given the standard diagnostic process is relatively subjective and includes a series of provocative tests. Although physician reimbursement was noted as the least significant factor preventing broader adoption, this may be underrepresented in our survey given the following chart ([Exhibit 30](#)) clearly cites reimbursement as inadequate and our conversations has suggested this is a key hurdle, as we will discuss further below.

Current physician reimbursement is insufficient. We have discussed current physician reimbursement rates of \$715 for minimally invasive SI joint fusion as insufficient and a primary hinderance of physician willingness to perform the procedure. In July, CMS released proposed rates for FY20, and there was no change to payments for minimally invasive SI joint fusion (see [Three Codes; Four Implications](#)). Recall in 2017 CMS had raised CPT code 27279 as potentially misvalued suggesting stakeholders were recommending an increase in RVU to 14.23 (~\$900), however language in this year's federal register suggests stakeholders have suggested an RVU of 20 (in-line with open SIJF) may be more appropriate (~\$1.1k). Although CMS has proposed to maintain the

RVU and payment rate essentially constant vs last year, the organization will be soliciting public comments. We have discussed an increase to ~\$1k would be more in line with comparable procedures and is likely to drive additional physician interest in performing the procedure, which is consistent with respondent data from our survey. We note current Si-Bone guidance does not incorporate any changes to reimbursement rates, and any increases in rates is likely an upside catalyst for procedure volume.

Exhibit 25: % of Lower Back Pain Attributable to the SI Joint

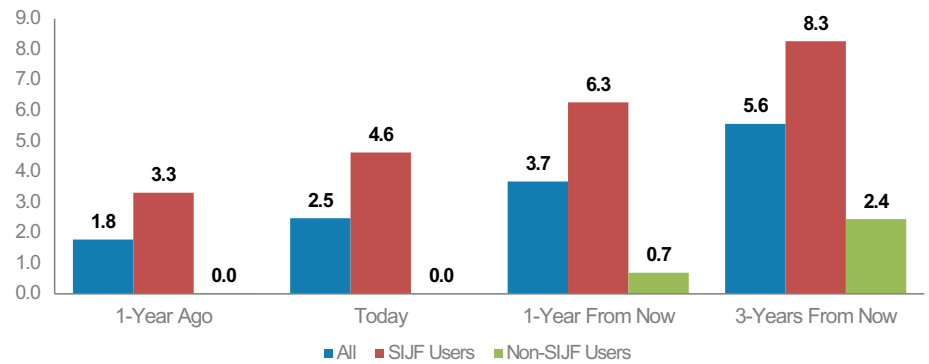
What percent of lower back pain is directly attributable to the Sacroiliac (SI) joint?



Source: Morgan Stanley Research, AlphaWise

Exhibit 26: SIJF Procedure Volume Growth

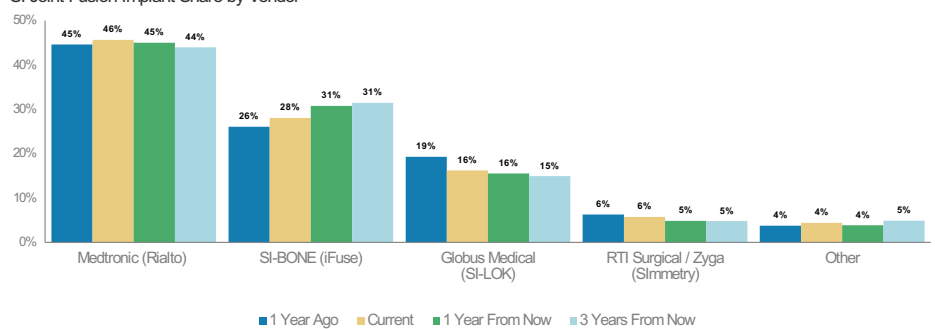
Average Number of SI Joint Fusion Procedures per Month



Source: Morgan Stanley Research, AlphaWise

Exhibit 27: SI Joint Fusion Market Share

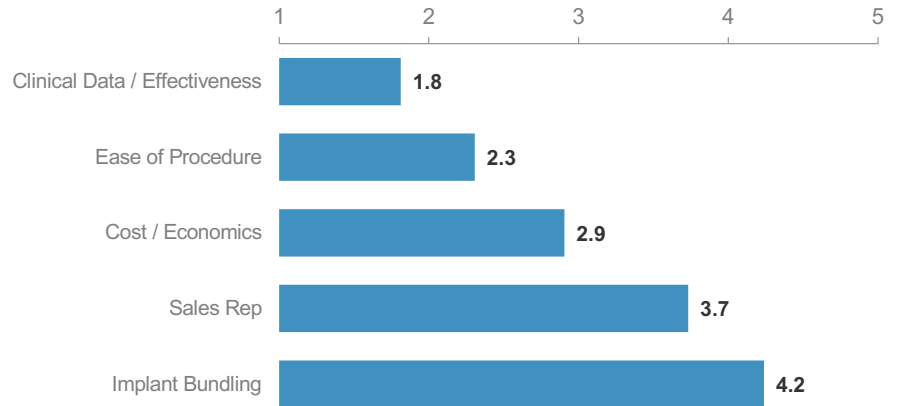
SI Joint Fusion Implant Share by Vendor



Source: Morgan Stanley Research, AlphaWise

Exhibit 28: Clinical data is most important to respondents when choosing an SIJF provider

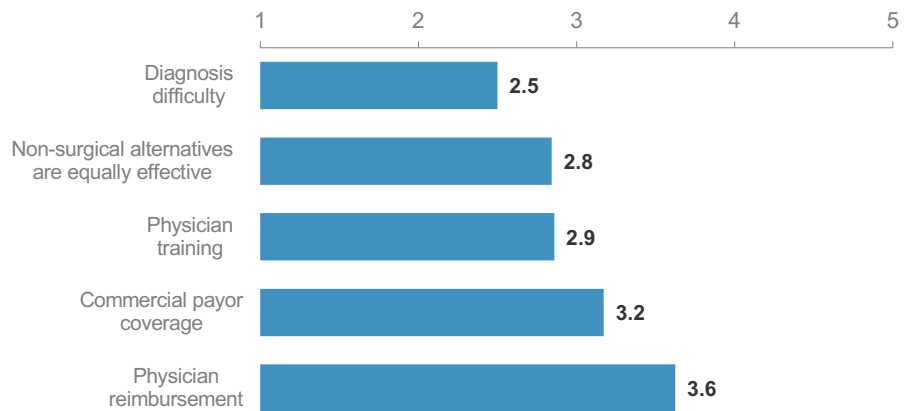
When choosing a provider for SI joint fusion implants, what is most important? (1=Most Important; 5=Least Important)



Source: Morgan Stanley Research, AlphaWise

Exhibit 29: Most Common Barriers to Adoption in SI Joint Fusion

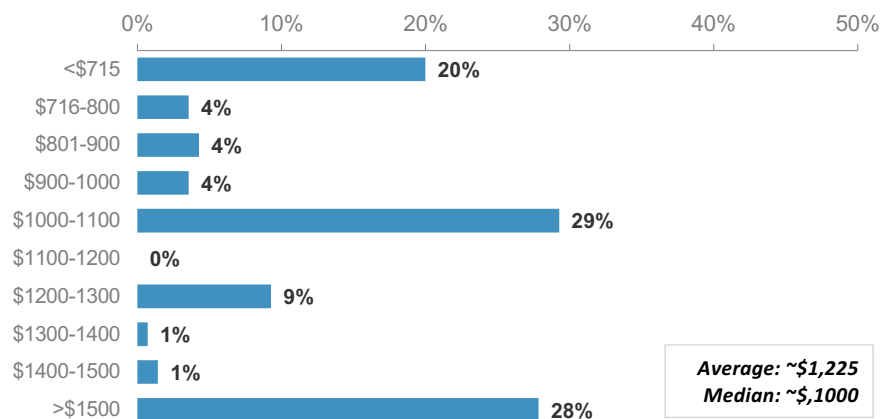
Barriers to Adoption of SI Joint Fusion (1=Most Significant; 5=Least Significant)



Source: Morgan Stanley Research, AlphaWise

Exhibit 30: Respondents believe \$1-1.3k is an adequate level of physician reimbursement

Satisfactory level of physician reimbursement for minimally invasive SI joint fusion



Source: Morgan Stanley Research, AlphaWise

Key Exhibits

Exhibit 31: Global Spine Growth Tracker

Organic Growth								
	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19
WW Spine Organic Growth								
Medtronic	-0.6%	-0.5%	1.0%	-0.3%	0.2%	0.0%	0.7%	1.7%
Depuy Synthes	-7.5%	-6.9%	-8.9%	-5.9%	-2.7%	-0.8%	-1.0%	-2.1%
NuVasive	4.7%	0.2%	1.6%	5.4%	8.3%	3.6%	6.6%	4.7%
Stryker	-2.2%	0.1%	-1.5%	4.2%	1.8%	2.1%	0.2%	-0.2%
Zimmer Biomet	-1.9%	0.5%	-2.8%	1.0%	0.4%	2.7%	2.7%	-4.4%
Globus	5.1%	8.8%	4.2%	2.7%	7.7%	8.6%	9.0%	14.9%
Alphatec	-22.6%	-22.7%	-18.1%	-6.7%	1.6%	10.0%	19.6%	27.9%
SeaSpine	1.4%	4.6%	4.1%	6.4%	13.0%	11.8%	9.0%	8.0%
Total	-1.0%	-0.5%	-0.8%	0.8%	2.1%	2.1%	2.3%	2.0%
Diversified	-2.9%	-2.1%	-2.5%	-1.0%	-0.4%	0.4%	0.5%	-0.4%
Pure-play	3.1%	2.7%	2.4%	4.9%	8.8%	6.5%	7.1%	8.0%
2-Year Stack/Momentum								
	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19
WW Spine Comp-Adjusted Organic Growth								
Medtronic	0.8%	2.8%	3.8%	0.8%	-0.5%	-0.5%	1.8%	1.4%
Depuy Synthes	-5.8%	-6.2%	-13.5%	-11.8%	-10.3%	-7.6%	-9.9%	-7.9%
NuVasive	9.2%	8.9%	7.1%	10.0%	13.1%	3.8%	8.2%	10.1%
Stryker	-0.8%	-2.3%	-3.4%	3.5%	-0.5%	2.1%	-1.3%	4.0%
Zimmer Biomet	-0.6%	0.6%	-1.2%	3.8%	-1.5%	3.2%	-0.1%	-3.4%
Globus	0.9%	7.0%	4.0%	3.8%	12.8%	17.4%	13.2%	17.6%
Alphatec	-24.2%	-27.8%	-30.7%	-21.1%	-21.0%	-12.6%	1.5%	21.2%
SeaSpine	-1.6%	-1.7%	5.7%	9.4%	14.4%	16.3%	13.1%	14.4%
Total	0.8%	1.5%	-0.1%	1.1%	1.1%	1.6%	1.4%	2.8%
Diversified	-1.4%	-0.7%	-2.6%	-2.1%	-3.3%	-1.6%	-2.0%	-1.4%
Pure-play	5.6%	6.4%	4.8%	7.4%	12.0%	9.2%	9.5%	12.9%

Source: Company Data, Morgan Stanley Research

Exhibit 32: Recent Spine M&A Deals

Date	Acquiror	Target	Value (\$bn)
Jun-16	Zimmer Biomet	LDR	\$1.0
Jul-16	Zimmer Biomet	Medtech	\$0.2
Jul-16	Globus	Alphatec Int'l	\$0.1
Jan-17	J&J	Interventional Spine	N/A
Jun-17	J&J	Sentio	N/A
Aug-17	Globus	KB Medical	N/A
Sep-17	NuVasive	Vertera	N/A
Dec-17	NuVasive	SafePassage	N/A
Feb-18	Stryker	Vexim	\$0.2
Aug-18	Stryker	K2	\$1.4
Sep-18	J&J	EIT	N/A
Sep-18	Globus	Surgimap	N/A
Sep-18	Medtronic	Mazor	\$1.6
May-19	Medtronic	Titan Spine	N/A
Sep-19	Stryker	Mobius	\$0.5
Total			\$5.0

Source: Company Data, Morgan Stanley Research
Note: Includes select M&A deals in Spine since June 2016

Valuation Methodology & Risks

GMED.N

Our \$45 price target is based on 15x 2020 EBITDA, in-line with SMID cap device peers which we see as warranted given outsized organic growth profile, however offset by exposure to a lower growth end-market and limited margin expansion opportunities

Key risks to our price target include (i) increases in turnover among sales force or distributors, (ii) ineffective balance sheet deployment, (iii) margins move significantly lower and, (iv) robotics uptake / competition.

JNJ.N

Our price target of \$145 for JNJ is based on a 15.8x multiple off of our base case 2020e EPS. We assume J&J trades at a slight discount to the S&P 500 given growth acceleration in Pharma and a flexible balance sheet. Pharma slows in 2019 given several competitive headwinds but this is offset by pipeline contributions and improvement on Devices and Consumer. J&J trades at a greater discount to the S&P than historical levels given higher Pharma mix. Talc litigation remains an overhang for investors.

Risks to our Equal-weight rating include (i) Pharma pipeline is unable to offset biosimilar and competitive risks, (ii) Margin expansion initiatives fail to materialize and/or pricing and mix become material headwinds, (iii) Turnarounds in Consumer and MD&D fail to materialize or occur more slowly than expected, (iv) Bear case in talc litigation plays out.

MDT.N

Our price target of \$111 reflects ~19x our CY20e EPS, a ~2 turn discount to large cap peers. Medtronic's long-term profile is mid-single digit organic growth, with 40-50 bps of margin expansion, and high-single-digit EPS growth for a 10% total return profile. However, questions about the durability and achievability of this profile in FY20 lead to a discount versus peers.

Key risks to our price target include: (i) Material competitive landscape changes (SCS, CRM, DBS, TAVR, DCB, and LINQ); (ii) A slowdown or acceleration in emerging markets; and (iii) Lower repurchase activity or a material acquisition.

NUVA.O

Our price target of \$67. Derived from our base case scenario. Our 14x EV/EBITDA multiple reflects a 1 turn discount to SMID cap peers, which we believe is justified given the outsized exposure to a pressured end-market. Organic sales growth maintains mid-single digit levels while the company drives 50-100 bps of annual margin improvements. Robotics does not make a material impact in the spine market in the near-term.

Key risks to our price target include (i) industry consolidation, (ii) poor execution on acquisitions, (iii) margins trend significantly higher or lower than our expectations and (iv) large, diversified spine players, make above market growth more difficult.

SIBN.O

Our price target of \$24 for Si-Bone is based on our DCF valuation assuming a ~9.5%

WACC. We model terminal year operating margins at ~25%, similar to spine comparables. Our price target implies a ~6.8x multiple to our base case 2020e sales, which is a premium to core spine comparables given outsized growth, and a slight discount to high growth SMID cap device companies given acceleration in the business has yet to be proven out.

Risks to our price target include (i) inability to gain additional reimbursement coverage from commercial payors, (ii) physician interest remains limited given relatively low reimbursement, (iii) SI joint fusion market does not develop as expected and operates as a small niche market, and (iv) limited visibility into pipeline efforts or additional product offerings beyond iFuse.

SYK.N

Our price target for SYK is \$230. Our 25x multiple is a four turn premium to peers and reflects Stryker's above-peer top-line growth, diversity in revenue, its opportunities for leverage, and additional balance sheet capacity.

Risks to our price target include: organic sales growth slows, lower than expected growth in orthopedic procedure volumes, slower growth in hospital capital spending, sage business does not recover as anticipated and, dilutive capital deployment.


ZBH.N

Our price target for ZBH is \$150. Derived from base case scenario. We value Zimmer Biomet at 18x 2020 EPS. Our 18x multiple is a ~3 turn discount to peers, given outsized exposure to the slow growth recon end market and a challenged balance sheet..

Risks to our price target include (i) pricing pressure may accelerate and pressure growth and gross margins, (ii) cash flow generation may be less than we anticipate, (iii) Execution on supply recovery continues to take longer, (iv) Warning letter leads to further action by FDA impacting sales and costs and, (v) Stryker's Mako launch drives material share away from Zimmer Biomet.

More on AlphaWise

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AlphaWise

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	COUNT	% OF TOTAL	COUNT	% OF TOTAL IBC	% OF RATING CATEGORY	COUNT	% OF TOTAL OTHER MISC
Overweight/Buy	1126	36%	290	43%	26%	522	37%
Equal-weight/Hold	1432	46%	306	46%	21%	661	47%
Not-Rated/Hold	1	0%	0	0%	0%	1	0%
Underweight/Sell	568	18%	74	11%	13%	231	16%
TOTAL	3,127		670			1415	

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Abbott Laboratories (ABT.N)	O (01/02/2018)	\$83.58
Abiomed (ABMD.O)	E (08/01/2019)	\$190.54
Alcon Inc (ALC.N)	O (04/09/2019)	\$59.83
Avanos Medical Inc (AVNS.N)	U (10/12/2015)	\$37.42
Axonics Modulation Technologies Inc. (AMNXO)	O (11/26/2018)	\$31.94
Baxter International (BAXN)	O (01/02/2019)	\$87.57
Becton Dickinson (BDXN)	E (01/04/2016)	\$258.15
Boston Scientific (BSXN)	O (10/16/2015)	\$42.32
DexCom Inc (DXCM.O)	E (01/03/2017)	\$153.70
Edwards Lifesciences (EW.N)	O (07/06/2015)	\$219.42
Globus Medical Inc (GMED.N)	E (01/02/2019)	\$51.32
Haemonetics Corporation (HAE.N)	O (01/02/2018)	\$127.05
Hill-Rom Holdings Inc. (HRC.N)	E (01/02/2018)	\$103.71
Hologic, Inc. (HOLX.O)	U (01/02/2019)	\$50.00
Insulet Corp. (PODD.O)	E (11/02/2015)	\$145.07
Intuitive Surgical Inc. (ISRG.O)	O (01/04/2016)	\$530.17
IRHYTHM TECHNOLOGIES INC (IRTC.O)	O (11/14/2016)	\$79.72
Johnson & Johnson (JNJ.N)	E (08/10/2010)	\$129.67
Medtronic PLC (MDT.N)	E (01/03/2017)	\$109.34
Nevro Corp (NVRO.N)	O (03/20/2019)	\$89.85
NuVasive Inc (NUVA.O)	E (09/14/2015)	\$65.30
Shockwave Medical Inc. (SWAV.O)	E (04/01/2019)	\$33.09
SI-BONE Inc. (SIBN.O)	O (11/12/2018)	\$19.54
Stryker Corporation (SYK.N)	O (01/08/2010)	\$218.40
Teleflex Inc. (TFX.N)	O (09/06/2017)	\$338.64
Transmedics Group Inc (TMDX.O)	E (05/28/2019)	\$23.80
ViewRay Inc (VRAY.O)	E (12/11/2018)	\$3.75
Zimmer Biomet Holdings Inc (ZBH.N)	O (01/05/2015)	\$138.84

Stock Ratings are subject to change. Please see latest research for each company.

* Historical prices are not split adjusted.