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Worldwide orthopaedic* markets in 2018:
44 BUS$ (+4% vs 2017)

- **Knee**: 10 BUS$, +3.6%
- **Spine**: 9 BUS$, +2.8%
- **Trauma**: 8.4 BUS$, +4.9%
- **Hip**: 7 BUS$, +2.2%

Source: Avicenne research & analysis 2019

- * Not included: Power tools, Arthroscopy & soft tissue repair, sport Medicine, Neuro-stimulation
- ** Trauma includes CMF
- Extremities: Shoulder, Elbow, Ankle, Foot, hand, … (excluding trauma)
- Orthobiologics: Allograft, Xenograft, Synthetic Bone, Cement, BMP, others, Cell based Product, Auto repair product, Anti Adhesion product, Hyaluronic Acid,…
- Other: Navigation, ortho. equipment, etc..
Worldwide orthopaedic market growth

Double digit growth of the years 2000-2010 is gone for the main segments (Spine, Knee, Hip), healthy single digit growth is still observed, with some niche market segments still enjoying high growth, as well as some newly created markets like extremities.

**2000 - 2010 CAGR**

- AVERAGE Total Ortho: 11.4%
- SPINE: 11.5%
- KNEE: 13.3%
- HIP: 10.4%

**2010 - 2015 CAGR**

- AVERAGE Total Ortho: 4.6%
- SPINE: 2.9%
- KNEE: 5.0%
- HIP: 2.4%
- EXTREMITIES: 11.5%

**2015 - 2018 CAGR**

- AVERAGE Total Ortho: 4.1%
- SPINE: 2.9%
- KNEE: 4.0%
- HIP: 2.1%
- EXTREMITIES: 9.4%

*Source: Avicenne research & analysis 2019*
Worldwide implants market in 2018 in value (BUS$)

Market value (BUS$)

Source: Avicenne research & analysis 2019
Worldwide implants & Orthobiologics market in 2018 in value (BUS$)

Market value (BUS$)

Source: Avicenne research & analysis 2019

*Extremities: Shoulder, Elbow, Ankle, Foot, hand,… (excluding trauma)
**Orthobiologics: Allograft, Xenograft, Synthetic Bone, Cement, BMP, others, Cell based Product, Auto repair product, Anti Adhesion product, Hyaluronic Acid,…
Worldwide orthopaedic market in 2018: competition

2018 Worldwide Orthopaedic Market: 44 BUS$

2018 revenues for Majors ~25 BUS$

Source: Avicenne research & analysis 2019
Worldwide orthopaedic market in 2018: competition (2/2)

2018 Worldwide Orthopaedic Market: 44 BUS$

- Depuy Synthes: 19%
- Zimmer Biomet: 15%
- Stryker: 13%
- Medtronic: 6%
- Smith & Nephew: 5%
- Ortho products: 2018
- Others: 42%

2018 revenues for Majors ~25 BUS$

- Depuy-Synthes: 8,1
- Zimmer Biomet: 6,8
- Stryker: 5,8
- Medtronic: 2,7
- Smith & Nephew: 2,1

Source: Avicenne research & analysis 2019

Worldwide Orthopaedic Market & Contract Manufacturing trends

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Majors vs. Challengers: Majors saved their margins while Challengers got the growth!

**WW Ortho 2018 market share (%)**

<table>
<thead>
<tr>
<th>Company</th>
<th>EBITDA %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimmer Biomet</td>
<td>33.4%</td>
</tr>
<tr>
<td>Stryker</td>
<td>28.1%</td>
</tr>
<tr>
<td>J&amp;J</td>
<td>33.2%</td>
</tr>
<tr>
<td>Medtronic</td>
<td>30.6%</td>
</tr>
<tr>
<td>Smith &amp; Nephew</td>
<td>29.3%</td>
</tr>
<tr>
<td>Wright</td>
<td>12.2%</td>
</tr>
<tr>
<td>Corin</td>
<td>19.8%</td>
</tr>
<tr>
<td>Nuvasive</td>
<td>19.5%</td>
</tr>
<tr>
<td>LIMA</td>
<td>20.6%</td>
</tr>
<tr>
<td>Amplitude</td>
<td>18.0%</td>
</tr>
</tbody>
</table>

- Export: apart from their home country
- **Excluding orthobiologics

Source: Avicenne, annual reports and companies 2019
Worldwide orthopaedic market forecasts

Worldwide orthopaedic market: CAGR 2018-2023  +4 %

Orthopaedics market Drivers in 2000-2010:
- Huge growth in hip & knee in developed countries
- USA: No price erosion, Europe slow price erosion
- Huge growth in spine procedures

Orthopaedics market Drivers: 2018-2023
- High growth in volume in emerging countries
- Orthobiologics & knee growth in developed countries
- Extremities become multi Billion market with almost double-digit growth
- Trauma with historical constant growth
- Niche segments with high growth: vertebral disks, etc.

Orthopaedics market limiters: 2018-2023
- Price pressure at the end-market level
- Continuous regulatory cost increase
- Purchasing group power, in certain countries

Orthopaedics market: CAGR 2018-2023 4%

Source: Avicenne analysis 2019
Worldwide Orthopaedic Market & Contract Manufacturing trends

Contact Manufacturing processes segmentation & Raw materials: 14 segments & 62 sub-segments

- Forging & casting
  - Hip stem forged
  - Trauma internal plate
  - Knee tibial forged
  - Hip cup forged
  - Trauma screws, hooks machined
  - Trauma LF & LC plate
  - Knee femoral forged
  - Spine machined
  - Hip stem forged
  - Hip head forged
  - Knee tibial forged

- Machining
  - Hip stem forged
  - Hip head forged
  - Hip stem casted
  - Hip head casted
  - Hip stem machined
  - Hip head machined
  - Hip stem casted
  - Hip head casted
  - Hip stem machined
  - Hip head machined

- Casting
  - Hip stem forged
  - Hip head forged
  - Hip stem casted
  - Hip head casted
  - Hip stem machined
  - Hip head machined

- Forging
  - Hip stem forged
  - Hip head forged
  - Hip stem casted
  - Hip head casted
  - Hip stem machined
  - Hip head machined

- Casting
  - Hip stem forged
  - Hip head forged
  - Hip stem casted
  - Hip head casted
  - Hip stem machined
  - Hip head machined

- Machining
  - Hip stem forged
  - Hip head forged
  - Hip stem casted
  - Hip head casted
  - Hip stem machined
  - Hip head machined

- Raw materials
  - Titanium
    - Hip stem forged
    - Hip head forged
    - Hip stem casted
    - Hip head casted
    - Hip stem machined
    - Hip head machined
  - Stainless Steel
    - Hip stem forged
    - Hip head forged
    - Hip stem casted
    - Hip head casted
    - Hip stem machined
    - Hip head machined
  - Coatings
    - Hip stem forged
    - Hip head forged
    - Hip stem casted
    - Hip head casted
    - Hip stem machined
    - Hip head machined

Source: Avicenne 2019
Contract Manufacturing market value chain: Major OEMs have a different outsourcing strategy Vs Challengers. Challengers outsource almost all their products.

**Orthopaedic companies**
- **OEM**
  - Revenues in 2018: ~44 BUS$
  - 5 majors & Several hundreds challengers

**Contract Manufacturers**
- **Implants**
- **Instruments**
- **Cases & Trays**

**Hospitals & Clinics**

Source: Avicenne Research & Analysis 2019
OEM Contract Manufacturing strategy: Zimmer Biomet
Only Major still with significant forging capabilities

**Casting:** In-House → Warsaw (USA)

**Forging:** Winterthur (CH) – Berlin (Gr)

**Machining & other facilities:** Warsaw, Dover, Parsippany, Jacksonville, Palm Beach Gardens, Austin (USA) - Winterthur (CH) – Berlin (Gr) - Bridgend (UK) – Shannon, Galway (Ir) - Valence (Fr) - Valencia (Spain) - Ponce (Puerto Rico) - Beijing, Jinhua, Changzhou (China)

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**Contract Manufacturing Rate**

- **Implants Forging**
- **Implants Casting**
- **Implants Machining & Finishing**
- **Instruments**
- **Cases & Trays**
- **Ceramics**
- **Coating**
- **Packaging**

**Implants Forging**:
- Hip stem
- Tibial knee
- Hip cup
- Trauma LF plate
- Trauma Lock plate

**Implants Casting**:
- Hip stem
- Hip cup
- Hip head
- Hip liner
- Knee femoral
- Knee tibial
- Knee insert
- Trauma plates & screws
- Spine cervical
- Spine lumbar

Source: Avicenne 2019
Orthopaedic Contract Manufacturers offering full range of products (Implants, Instruments, Cases & Trays) in 2018

New players are entering the market: Medplast, now VIAN'T, with Integer acquisition will make 380 MUS$ in Orthopaedic and Spine. NN Inc. with Paragon acquisition will reach 175 MUS$ revenues in Orthopaedic and Spine in 2018 (+100 MUS$ other medical). Avalign will make 160 MUS$, In’Tech medical will reach close to 120 MUS$.

Source: Avicenne 2019

2017-2018 M&A activity

- NN group acquired
  - Paragon (April 2018)
  - DRT Medical (Oct. 2017)
- Medplast acquired
  - Integer AS&O (May 2018)
  - Vention Medical (February 2017)
  - Orthoplastics (Oct. 2013)
- Avalign acquired
  - Thortex (July 2017)
  - Millenium surgical (July 2017)
- Intech Medical acquired
  - Pyxidis (Oct. 2017)
  - Bradshaw Medical (May 2018)
- Marle acquired
  - SMB (July 2017)
Contract Manufacturing competitors’ ranking & dispersion

While OEM industry is very concentrated (Top 5, 58%), CMO industry is still fairly fragmented (Top 5, 27%).

Source: Avicenne 2019
Contract Manufacturing industry still needs more concentration

The comparison between COGS (Cost of Goods Sold) spending of ~5.8 BUS$ from Majors and Top 20 CMO revenues of 3 BUS$ shows a significant imbalance. Majors will require larger players to keep outsourcing confidently. Today Majors have limited options for their manufacturing strategy: outsourcing more would mean reaching out for smaller CMOs, and they are reluctant to increase the number of suppliers.

Top 5 Majors COGS
5.8 BUS$

Top 20 CMOs:
3 BUS$
53% of CM market

Source: Avicenne 2019
Orthopaedic Contract Manufacturing concentration by acquisition

- **2018**: HD Surgical
- **2016**: Mountainside Medical
- **2014**: 3D Medical
- **2014**: Symmetry
- **2012**: Teleflex
- **2011**: Kemac Technology
- **1963**: Tecomet

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- **2018**: Orthoplastics
- **2017**: Vention Medical
- **2013**: Integer

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- **2015**: Lake Region
- **2014**: CCC Medical Devices
- **2013**: MicroPower
- **2012**: NeuroNexus
- **2008**: Depuy Facilities
- **2008**: PRECIMED
- **2007**: EAC & Ouan Emerteq &Intellisensing & Enpath Medical & Biomec Inc.
- **2004**: NanoGram
- **2002**: Globe Tool
- **2001**: Sierra-KD
- **1998**: Medical Components
- **1998**: Hittman Materials
- **1977**: Wilson Greatbatch

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- **2018**: Integer

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- **2015**: Alhena & Cam Bioceramics China
- **2012**: Sandvik
- **2008**: Azary Technologies
- **2007**: MPS & Keller & Anzon
- **2006**: McDee
- **2005**: Bio-Coat
- **2004**: Unique Design
- **2003**: Stro Met Inc
- **2001**: HY-VAC
- **1992**: Stealth Technologies
- **1977**: Unique Instruments

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**Top 1: 430 MUS$**
Symmetry acquired by Tecomet

**Top 2: 380 MUS$**
Integer AS&O acquired by Viant (Medplast)

**Top 3: 305 MUS$**
Sandvik acquired by Orchid

Source: Avicenne analysis 2019
The Orthopaedics Contract Manufacturing market is growing faster than In-house manufacturing

In-house manufacturing is growing at a lower rate than overall market growth, hence Contract manufacturing is capturing the difference.

2012-2023 Orthopaedics Contract Manufacturing (BUS$)

CAGR Contract Manufacturing 12-18: 6.8 %
CAGR Contract Manufacturing 18-23: 7 %

CAGR In-house 12-18: 2.8 %
CAGR In-House 18-23: 3.3 %

Source: Avicenne analysis 2019
Contract Manufacturing market is growing at 7 % per year, a faster rate than the orthopaedic market

Main drivers for this faster growth are: Challengers who outsource more are taking away market share from Majors and gradual divestment from Majors.

Source: Avicenne research & analysis 2019
OEM facility disinvestments: Huge impact of Depuy Synthes – Jabil deal for 2019

Contract Manufacturing market will be boosted by Depuy Synthes – Jabil deal. Depuy disinvestment concerning 14 facilities worldwide include 7 in Switzerland.

**Depuy Synthes Switzerland facilities to be disinvested**

<table>
<thead>
<tr>
<th>Cantons</th>
<th>Facilities</th>
<th>Workforce</th>
<th>Ortho. activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solothurn</td>
<td>Grenchen</td>
<td>320</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Bettlach</td>
<td>370</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Balsthal</td>
<td>110</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Hagendorf</td>
<td>340</td>
<td>✓</td>
</tr>
<tr>
<td>Neuchatel</td>
<td>Le Locle</td>
<td>250</td>
<td>✓</td>
</tr>
<tr>
<td>Wallis</td>
<td>Raron</td>
<td>235</td>
<td>✓</td>
</tr>
<tr>
<td>Ticino</td>
<td>Mezzovico</td>
<td>560</td>
<td>✓</td>
</tr>
</tbody>
</table>
Is Additive Manufacturing the right option for the implant Contract Manufacturing business? Analysis of different products & players for reconstructive implants, cages and customized implants

Reconstructive Contract Manufacturers will see a growing demand for Additive Manufacturing! “Standard” cages made by Additive Manufacturing will reach the mass market. For some complex or customized implants, Additive Manufacturing represents an easier manufacturing process and removes many steps compared the machining process.

Source: Avicenne analysis 2018
Is Additive Manufacturing the right option for the instruments Contract Manufacturing business? Analysis of different products & players for customized cutting guides and complex instruments

Instruments manufacturers will increasingly use Additive Manufacturing, which gives higher flexibility for the customized cutting guides and certain complex instruments. The time to market is the main driver for these instruments.
Stryker announced massive investments in 3D Printing

In 2016 a $400 million plan to build a 3-D printing manufacturing facility in Ireland was released

**Stryker’s History of 3D Printing**

2001: Research begins with University  
2007: 1st Prototype Equipment in Stryker Facility  
2011: 1st Production capable hardware & software delivered to Stryker  
2013: 1st surgeries: Triathlon tibial baseplate  
2016: Tritanium 3D printing technology from Stryker

**Tritanium®**  
In-Growth Technology™  
Built to fuse™

- March 2018: FDA Clearance for 3D-Printed Tritanium TL Curved Posterior Lumbar Cage  
- Sept. 2018: MOJAVE PL 3D spinal lumbar complex cage from K2M (acquired by STRYKER)  
- 2018-2019: Stryker expand massively its 3D printed spine cages portfolio  
- 2018-2019: Tritanium 3D printing technology from Stryker
Additive Manufacturing has today a slight impact on forging, casting & machining of implants. In 2018, we estimate in Europe that less than 6% of all parts of the hips, knees, shoulder, trauma are made by Additive Manufacturing.

- Additive Manufacturing focuses mainly on cementless implants. In 2018, 5.1% of all hip, knee, shoulder, trauma are made with Additive Manufacturing. The rest are forged, casted or machined.
- In 2021, we estimate at 7.6% of the total hip, knee, shoulder, trauma parts will be made by Additive Manufacturing.

**Europe AM market shares (nb of pieces/ total) 2012-2021:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Hip Cups in Europe</th>
<th>Forged CM</th>
<th>Forged IH</th>
<th>Casted CM</th>
<th>Casted IH</th>
<th>Machined CM</th>
<th>Machined IH</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>1,034,000 units</td>
<td>818K</td>
<td>165K</td>
<td>235K</td>
<td>479K</td>
<td>508K</td>
<td>576K</td>
</tr>
</tbody>
</table>

Source: Avicenne analysis

**Total hip cups in Europe in 2018: 1,034,000 units**

**Addressable market: Cementless**
Cage Raw Materials in the five main countries in Europe: As Peek and Titanium lose market share, Additive Manufacturing for cages increases dramatically

In Europe, when Peek cages lose market share (-4.5 % CAGR by 2018) and Titanium cages also decrease by -1.8 % in the five main countries, Additive Manufacturing & Trabecular cages will increase by 19 % and achieve more than 61,000 units in 2018.
Raw Materials

- Hip, knee, Trauma & spine: Raw materials and manufacturing process
- Titanium needs for orthopaedics in 2018
- Stainless steel & Cr-Co needs for orthopaedics in 2018
- Raw materials by implant type in 2018
- Raw materials needs by OEMs in 2018
- Major OEMs raw material sourcing strategy
- Depuy Synthes, Stryker, Zimmer Biomet, Smith & Nephev needs in 2018
- Challengers raw materials needs in 2018
Worldwide Titanium consumption for Orthopaedics

Titanium: 4,400 Tons are used for implants in 2018

In Tons

<table>
<thead>
<tr>
<th>Implant Type</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip stem</td>
<td>980</td>
</tr>
<tr>
<td>Hip cup</td>
<td>390</td>
</tr>
<tr>
<td>Knee femoral</td>
<td>90</td>
</tr>
<tr>
<td>Knee Tibial</td>
<td>470</td>
</tr>
<tr>
<td>Trauma LF 200</td>
<td></td>
</tr>
<tr>
<td>Trauma LC 60</td>
<td></td>
</tr>
<tr>
<td>Trauma internal plate 870</td>
<td></td>
</tr>
<tr>
<td>Trauma screws, hooks... 370</td>
<td></td>
</tr>
<tr>
<td>Spine Lumbar screws, hooks... 230</td>
<td></td>
</tr>
<tr>
<td>Spine Cervical 75</td>
<td></td>
</tr>
</tbody>
</table>

Hip 36%
Knee 15%
Spine 7%
Trauma 42%

Source: Avicenne 2019
Worldwide Stainless steel consumption for orthopaedics in 2018

Stainless steel: 12,900 Tons are used and 80%+ for instruments in 2018

Stainless Steel used by segment in 2018

Source: Avicenne 2019
Worldwide Cr-Co consumption for orthopaedics in 2018

Cr-Co: 3,600 Tons are mainly used for knee implants in 2018

Cr-Co used by implants type in 2018

Source: Avicenne 2019
Worldwide Raw materials by material type & process in 2018

4,900 Tons of titanium are used in Orthopaedics, 3,600 Tons of Cr-Co
10,500 Tons of Stainless steel are used to manufacture instruments,
1,200 Tons to produce implants and 1,200 Tons to manufacture cases

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Hip</th>
<th>Knee</th>
<th>Spine</th>
<th>Trauma</th>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel implants</td>
<td>875</td>
<td>65</td>
<td>280</td>
<td>1,200 Tons</td>
<td></td>
</tr>
<tr>
<td>Stainless steel cases</td>
<td>300</td>
<td>735</td>
<td>1,200 Tons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cr-Co casting</td>
<td>185</td>
<td>35</td>
<td>585 Tons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ti instruments</td>
<td>525</td>
<td>500 Tons</td>
<td>2,550</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ti implants</td>
<td>1,570</td>
<td>665</td>
<td>330</td>
<td>1,840 Tons</td>
<td></td>
</tr>
</tbody>
</table>

Source: Avicenne 2019
Worldwide Orthopaedic Market & Contract Manufacturing trends

10,500 Tons of raw materials are used for knee and 6,500 Tons are used for hip in 2018

Source: Avicenne 2019
Worldwide raw materials needs by OEMs in 2018

Titanium needs in Tons for orthopaedic players:

**The Majors**, 1900 Tons of Titanium for in-house Manufacturing and 1400 Tons for their Contract Manufacturing.

**The Challengers**: 240 Tons in-house & 1350 Tons for CM.

55% of Titanium use is by the contract Manufacturers.

**DePuySynthes**
- Titanium: 757 Tons
- Stainless steel instruments: 300 Tons
- Stainless steel implants: 93 Tons
- Cr-Co machined: 80 Tons
- Cr-Co casting: 188 Tons

**Stryker**
- Titanium: 383 Tons
- Stainless steel instruments: 109 Tons
- Stainless steel implants: 63 Tons
- Cr-Co machined: 52 Tons
- Cr-Co casting: 390 Tons

**Zimmer Biomet**
- Titanium: 610 Tons
- Stainless steel instruments: 159 Tons
- Stainless steel implants: 61 Tons
- Cr-Co machined: 31 Tons
- Cr-Co casting: 710 Tons

**Smith & Nephew**
- Titanium: 71 Tons
- Stainless steel instruments: 91 Tons
- Stainless steel implants: 8 Tons
- Cr-Co machined: 27 Tons
- Cr-Co casting: 298 Tons

**Medtronic**
- Titanium: 100 Tons
- Stainless steel instruments: 76 Tons
- Stainless steel implants: 2 Tons
- Cr-Co machined: 28 Tons
- Cr-Co casting: 7 Tons

**All Challengers**
- Titanium: 242 Tons
- Stainless steel instruments: 205 Tons
- Stainless steel implants: 42 Tons
- Cr-Co machined: 293 Tons
- Cr-Co casting: 77 Tons

Source: Avicenne 2019
### Worldwide Orthopaedic Market & Contract Manufacturing trends

#### STRYKER raw materials needs in 2018:

- **In house needs:** Titanium 385 T
- **Outsourcing needs:** Titanium 440 T

<table>
<thead>
<tr>
<th></th>
<th>Hip</th>
<th>Knee</th>
<th>Spine</th>
<th>Trauma</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Company market shares</strong></td>
<td>19%</td>
<td>17%</td>
<td>9%</td>
<td>17%</td>
</tr>
<tr>
<td><strong>Outsourcing rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruments</td>
<td>97%</td>
<td>98%</td>
<td>83%</td>
<td>50%</td>
</tr>
<tr>
<td>Implants</td>
<td>100%</td>
<td>10%</td>
<td>50%</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Raw materials for contract manufacturing needs (In Tons)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cr-Co casting Titanium</td>
<td>91</td>
<td>43</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Stainless steel instruments</td>
<td>298</td>
<td>11</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Stainless steel implants</td>
<td>537</td>
<td>1016</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Raw materials for in house needs (In Tons)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cr-Co casting Titanium</td>
<td>390</td>
<td>6</td>
<td>6</td>
<td>23</td>
</tr>
<tr>
<td>Stainless steel instruments</td>
<td>101</td>
<td>15</td>
<td>12</td>
<td>219</td>
</tr>
<tr>
<td>Stainless steel implants</td>
<td>21</td>
<td>21</td>
<td>0.0</td>
<td>59</td>
</tr>
</tbody>
</table>

Source: Avicenne 2019
The orthopaedics market, including hip, knee, spine, trauma, extremities and orthobiologics accounted for more than US$44Bn in 2018.

In 2000, the orthopaedic market was US$11Bn. It grew to US$44Bn in 2018, and will achieve more than US$54Bn in 2023. This represents an average of 4% growth in the coming years.

Even the 5 major companies, controlling 58% of the worldwide orthopaedics market, have continuously lost market share to the challengers. The challengers have gained 1 to 2% market share per year achieving US$18Bn in revenue in 2018.

To manufacture implants, instruments & related products, orthopaedic companies in 2018 spent US$4.4Bn in-House (+3.1% vs 2017) and paid their contract manufacturers US$5.7Bn (+6.5% Vs 2017).

In the Orthopaedic Contract Manufacturing market in 2018, Challengers accounted for US$2.7Bn, a high amount explained by their higher rate of outsourcing and faster growth, followed by Depuy Synthes (US$1Bn), Zimmer Biomet (US$0.7Bn), Stryker (US$0.65Bn) and Smith & Nephew (US$0.45Bn).
Take home messages (3/3)

- The Majors want to reduce the number of their Contact Manufacturers. The response to this need is Contract Manufacturing market concentration (this is already happening).

- In 2019, The CM market will be hugely impacted by the Depuy Synthes–Jabil deal including a massive disinvestment of 14 facilities by Depuy Synthes.

- While increased outsourcing is a heavy trend, a few rare, specific cases show that some players in the spine market want to internalize a small proportion of their manufacturing. In our view, this will not modify the general evolution of Contract Manufacturing, where outsourcing is set to remain the dominant trend.

- The Contract Manufacturing market benefits from the main orthopaedic drivers: population ageing and product mix evolution. It also has its own intrinsic drivers: OEM implant facilities divestments and the growth of challengers’ market share, which is significantly bolstering this market, due to their high outsourcing rate.

- By 2023, the Contract Manufacturing market will still be growing faster than In-House.

- Contract Manufacturing will remain a robust market with 7% CAGR by 2023.
Take home messages (3/3)

- In 2018, more than 600 Additive Manufacturing machines produced orthopaedic implants.
- Stryker announced a $400 million plan to build a 3-D printing manufacturing facility in Ireland and Depuy Synthes US$40M.
- Market growth 2018-2023 for Metal Additive Manufacturing will be between 20% and 30%, according to several industry forecasts. Orthopaedic applications will be one of most dynamic segments, with almost 20% growth per year.
- 4400 Tons of Titanium were used for Implants in 2018. Hips and trauma accounted for almost 80% of this volume.
- 500 Tons of Titanium are used for the orthopaedic instruments.
- Titanium needs in Tons for orthopaedic players: the Majors, 1900 Tons of Titanium in-house and 1400 Tons for their Contract Manufacturing. The Challengers: 240 Tons in-house & 1350 Tons for CM.
- 55% of Titanium use is by Contract Manufacturers.
Thank you
Strategic Market Research & Transaction Services for the Orthopaedic industry

Avicenne Medical company profile

March 2019
A diversified service offering
Based on 27 years of experience in Orthopaedics

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Our story: Avicenne has been involved in most of the major deals & events within the Orthopaedic Industry

Strategic Due Diligence expertise with a long track record of successful acquisitions for our clients

Worldwide Orthopaedic Market & Contract Manufacturing trends

CONTACT
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## Avicenne’s long track record of successful acquisitions for our clients

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<td>MENIX GROUP</td>
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<td>Avicenne advised the Buyer</td>
<td>April 2014</td>
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Worldwide Orthopaedic Market & Contract Manufacturing trends

**CONTACT**

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Our methodology
A dense contact network built over 27 years

Our contact network

Cross industry database connections
27 years of relationship & experience
Updated daily

32,000+ qualified contacts

Our Orthopaedics database:
32,000+ qualified contacts

Europe
11 500+ contacts
Emerging countries
BRIC, Eastern Europe, Latin America
Contract Manufacturers
6 500+ contacts
USA
17 000+ contacts
Example:
4 600+ decision makers for Spine OEMs

Worldwide Orthopaedic Market & Contract Manufacturing trends

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Implants conference

The international meeting on innovations & solutions for orthopaedic implants & orthobiologics chaired by Avicenne, attracts 150+ decision makers. It is both a place to take the pulse of the industry and a key networking event.

Founded and chaired by AVICENNE since 2005
http://www.implants-event.com
Our customers


AVICENNE’s off the shelf market reports

March 2019 8th edition

- First published in 2014
- OEMs strategy for outsourcing & home-made
- Detailed markets & sizing for:
  - Forging: hip stem, hip cup, femoral knee...
  - Casting: femoral knee, tibial knee, hip cup...
  - Hip, knee, spine & trauma and instruments machining & finishing
  - Cases & trays: hip, knee, spine, trauma
- Coating: stem, cup, femoral, tibial
- Ceramics: hip heads, hip liner
- Cleaning & packaging...
- Special focus on Raw Materials for orthopaedics: Stainless Steel, Cr-Co & Titanium needs for OEMs and Contract Manufacturers
- Top 200 Contract manufacturers detailed profiles

“European Orthopaedics Market 2018-2023”
March 2019 16th edition

- First published in 1993
- Yearly up-date
- Hip, knee, shoulder
- Based on 100+ interviews
- 810 pages & 1,550+ graphs & exhibits detail the European Market in Germany, France, Italy, Spain, UK, and other countries
- Special focus on the worldwide orthopaedic market, player dynamics and global market shares

“Worldwide Additive Manufacturing for orthopaedics 2016-2021 & player profiles”
February 2018 1st edition

- First published in 2018
- Yearly up-date,
- Market for Additive Manufacturing for orthopaedics
- Based on 50+ interviews of:
  - Additive Manufacturing machine suppliers
  - Dedicated companies in Additive Manufacturing (Specialist)
  - OEMs heavily invested in Additive Manufacturing or using it extensively
  - Contract manufacturers offering Additive Manufacturing service

“Orthopaedics patent watch”
Yearly edition

- Focus on 4 segments: hip, knee, trauma and orthobiologics
- Report published each 2 months
- More than 50 patents presented by number registration and with technical diagrams
- On demand:
  - Identifying the new products & R&D trends,
  - Monitoring your competitor’s strategic development choices.

Available immediately

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