Eliminate Adverse Events with Integrated Clinical Pathways

**Physician-led innovation maximizes value for patients and society**

Mark A. Snyder, MD, FAOA

The current healthcare environment is forcing hospitals to face uncertain futures and chart new courses as they shift from volume- to value-based systems and business models. According to Ian Morrison, author of *The Second Curve: Managing the Velocity of Change*, the second curve is the future—new technologies, new consumers, and new markets—and traditional methods of change are not sufficient to enable companies, including healthcare organizations, to survive.

A proven, multimodal problem-solving innovation called Zero in on Zero (ZIOZ) can radically reduce adverse events and lead to rapid achievement of Second Curve status in hospitals where hip and knee arthroplasty surgeries are performed. At Good Samaritan Hospital, where I serve as medical director of the Orthopedic Center of Excellence, ZIOZ has been used to radically reduce rates of complications, readmissions, and revisions after primary hip and knee arthroplasties.

In 2011, we simultaneously enacted integrated clinical pathways (ICPs) for 10 adverse events (Fig. 1). Since then (through 2017), more than 2,000 consecutive primary hip and knee arthroplasties have been performed, with the following results:

- no transfusions
- no hospital falls with injury
- no surgical site infections
- less than 0.1 percent venous thromboembolism (VTE) readmissions
- no serious 90-day opioid complications
- no early primary total hip dislocations

As implemented at our hospital, ZIOZ is a straightforward, user-friendly approach that has resulted in a less than 2 percent combined all-cause 30- and 90-day readmission rate, as verified through a Level III registry and a peer-reviewed Institutional Review Board study. It’s also resulted in a considerably lower cost of care.

In the Cincinnati Metropolitan Statistical Area—Bundled Payment Initiative for 2016 and 2017, the Medicare total episode spend for total hip arthroplasty (THA) and total knee arthroplasty (TKA) performed with full ZIOZ utilization was less than $18,000. This compares favorably (more than 20 percent lower) with the more than $23,000 mean spends for THA and TKA performed by all other surgeons in our health system’s two major teaching hospitals. The lower cost of care was driven by shortened length of stay, reduction of post-acute care inpatient stay, and minimal readmissions. It reflects the proven value concept proposed by Michael Porter and Tom Lee in 2013: achieving the best outcomes at the lowest cost.

**How we did it**

We used evidence-based, straightforward, and simultaneously enacted ICPs to address 10 adverse events. The major factors in the successful implementation of this process include multidisciplinary contributions, collaboration between health system employed and affiliated surgeons, and the triad leadership of a surgeon champion, high-ranking administrative leader, and the current program manager. We greatly appreciate the 7 years of support from the facility maintenance, clinical, and research staff, as well as from surgeons and hospital administrators.

In the process, we are also

**TABLE 1: INTEGRATED CLINICAL PATHWAY RECOMMENDATIONS FOR REDUCING BLOOD TRANSFUSIONS**

<table>
<thead>
<tr>
<th>Before TKA/THA</th>
<th>During (acute stay) TKA/THA</th>
<th>After TKA/THA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognition of anemia with complete blood count more than 4 weeks prior to surgery (S)</td>
<td>Regional anesthesia (M)</td>
<td>Avoidance of strong venous thromboembolism chemoprophylaxis in low-risk TKA and THA patients (S)</td>
</tr>
<tr>
<td>Correction of hemoglobin &lt; 13 (males) and &lt; 12 (females) with erythropoietin and iron supplements (S)</td>
<td>Hypotensive anesthesia for those requiring general anesthesia</td>
<td>Lovenox 40 mg daily in TKA/THA, international normalized ratio targets near 1.5 to 2.0 for coumadinized patients (M)</td>
</tr>
<tr>
<td>Referral to hematology if hemoglobin &lt; 10</td>
<td>Pre-op tranexamic acid (15 mg/kg) given 15 minutes before incision (S)</td>
<td>Transfusion trigger hemoglobin/hematocrit of 7/21 unless cardiac symptoms unstable (S)</td>
</tr>
<tr>
<td>Avoidance of autologous donation (M)</td>
<td>Decreased tourniquet time, bipolar cautery (W)</td>
<td>IV fluid correction of hypotension and mild postural changes (I)</td>
</tr>
<tr>
<td>Drain avoidance (M)</td>
<td></td>
<td></td>
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</tbody>
</table>

Key: Bold text = hospital implementation; Italic text = surgeon preference; S = strong evidence supports; M = moderate evidence supports; I = indeterminate evidence; W = weak evidence support

Source: Mark A. Snyder, MD

**Fig. 1 Zero in on Zero Multimodal Problem Solving Targets.** Ten adverse events in lower extremity arthroplasty best mitigated with simultaneously applied Integrated Clinical Pathways. COURTESY OF MARK A. SNYDER, MD, FAOA