Appendix

Appendix I. Mathematical definition of demand and shift optimization.

Equation 1. Definition of the demand.

Suppose we want to model the demand $D\ (d)$ on a particular day(d) according to the various critical tasks (CTs) that are expected of orthopaedic residents, where $D \in R, D\ \geq 0$. Then, the demand on a particular day(d)may be defined as:

$$D\ (d)\ =\ O(d) \cdot \overline{t_O} + T(d) \cdot \overline{t_T} + A(d) \cdot \overline{t_A} + C(d) \cdot \overline{t_C}\ +\ R$$

, where $O(d)$ is the number of ORs complete per day, $T(d)$ is the number of traumas seen per day, $A(d)$ is the number of admissions per day, $C(d)$ is the number of consults seen per day, and R is the baseline amount of time required to round per day. Similarly, $\overline{t_O}$ is the average amount of time it takes to complete an OR, $\overline{t_T}$ is the average amount of time it takes to complete a trauma, $\overline{t_A}$ is the average amount of time it takes to complete an admission, and $\overline{t_C}$ is the average amount of time it takes to complete a consult.

Equation 2. Definition of optimization potential possible.

Suppose N_{OS} is the total number of shifts of the optimized schedule on an annual basis, where $n_{OS}(d)$ is the number of residents in the optimized schedule on a particular day d. Suppose C is the cut-off on the demand of the residents, where $C \in R, C\ \geq 0$. Then, the number of residents on a particular day can be modeled by:

$$n_{OS}\ (d) = \begin{cases} 2, if\ D(d) > C \\ 1, if\ D(d) \leq C \end{cases}$$

The total number of shifts of the optimized schedule may be defined by:

$$N_{OS} = \sum_{d=1}^{D} n_{OS}(d)$$

Accordingly, the annual reduction possible may be defined as:

$$Reduction\ Possible\ = \frac{N_{HS} - N_{OS}}{N_{HS}} \cdot 100\%$$

, where N_{HS} is the historic number of residents scheduled, and N_{OS} is the optimized number of residents scheduled.