

Measurement of Interns' Ability to Engage Effectively in Practice-based Learning and Improvement

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The Accreditation Council for Graduate Medical Education (ACGME) mandates that residency programs teach and assess residents' practice-based learning and improvement (PBLI) skills – one of the ACGME core competencies. PBLI includes self-identifying strengths, deficiencies and gaps in knowledge and/ or expertise. It also means developing personal learning and improvement goals, identifying appropriate learning activities to address deficiencies and gaps, and incorporating formative feedback into daily practice (ACGME, 2007). Achievement of these competencies requires a sequence of activities that includes self-assessment. However, the literature provides substantial evidence that the majority of individuals who are learning medicine or who practice medicine are unable to accurately assess themselves effectively across the multiple domains of expertise required in medical practice (Davis et al., 2006; Eva et al., 2004; Fitzgerald et al., 2003; Fitzgerald et al., 2000). While there is some evidence that specific interventions can help individuals become better self-assessors (Pintrich, 1995; Kruger & Dunning, 1999), there is limited evidence that any medical schools have adopted structured, specific pedagogy that has yielded improved self-assessment effectiveness.

Residency directors use a wide array of data to make decisions about who might succeed in their programs. These data include clerkship grades (especially Honors), United States Medical Licensing Examination (USMLE) scores, electives and internship in specialty areas. Although there is some variation based on clinical specialty in the perceived value of these selection criteria, clerkship grades, USMLE scores, and Honors grades are among the most highly ranked (Green et al., 2009). However, these data provide no reliable way of predicting who has mastered effective self-assessment skills or for that matter practice-based learning and improvement, and as the ACGME and specialty societies begin

to implement specific milestones to be achieved by each resident, self-assessment competence will need to be evaluated (Carraccio & Burke, 2010; Green et al., 2009; Hicks et al., 2010).

A review of the higher education literature provides evidence linking developmental level and the ability to self-assess effectively (Kegan, 1994). Kegan's developmental model comprises five "orders of consciousness" through which humans develop in the context of how they think, feel, and relate to themselves and others. The first three orders are similar to those found in child and adolescent development theories. Kegan's work has shown that most adults in modern society reach the third order of consciousness, which marks the end of adolescence and the start of adulthood (Kegan, 1994). At the fourth order of consciousness, individuals are "self-authors"— they are capable of constructing their own value systems as opposed to operating according to values taught or demonstrated by others. Self-authors are able to self-reflect, self-assess, and self-direct; they are autonomous, critical thinkers and independent decision-makers (Kegan, 1994).

In this study we hypothesized that developmental level might inform us about our incoming interns in terms of their readiness for self-assessment and self-directed learning. Our study plan was to measure the developmental level of incoming interns and then to assess associations between developmental level and additional performance indicators (e.g., OSCE, USMLE) and demographics (e.g., age, sex, race-ethnicity) to determine if any of these variables predicted developmental level.

Methods

Kegan and colleagues conducted and analyzed longitudinal interviews with patients to measure developmental level; through analysis of the interviews they created the "orders of consciousness" scale and underlying theory (1994). This interview design is highly resource intensive. Loevinger's theory of ego development and its measurement instrument, the Washington University Sentence Completion Test (WUSCT), can also be used to measure developmental level (Loevinger, 1970). The ego

development model comprises nine successive stages that have been mapped to Kegan’s orders of consciousness (Table 1), allowing an individual’s order of consciousness to be approximated by the WUSCT (Wilber, 2000).

Table 1. Kegan’s Orders of Consciousness Mapped to Loevinger’s Ego Development Levels (Wilber, 2000).

Order	Subject	Object	Ego Level	Characteristics
0 – Incorporative	Reflexes	None	E1 – Pre-social	Survival-oriented
1 st – Impulsive	Impulses	Reflexes	E2 – Impulsive	Impulsive
2 nd – Imperial	Needs	Impulses	E3 – Self-Protective	Opportunistic
3 rd – Interpersonal	Relationships	Needs	E4 – Conformist	Seeks social approval
<i>Transition</i>			E5 – Self-Aware	Less socially dependent
4 th – Institutional	Authorship	Relationships	E6 – Conscientious	Reflective, self-critical
<i>Transition</i>			E7 – Individualistic	More tolerant
			E8 – Autonomous	Seeks self-fulfillment
5 th – Inter-individual	Inter-individuality	Authorship	E9 – Integrated	Self-realized

Two cohorts of incoming interns (n = 314) completed the WUSCT in July 2006 and July 2007. Two professional staff members were trained to score the instrument; one was the lead on the scoring project. They first conducted a pilot with 20 completed instruments and compared scores, assuring appropriate inter-rater reliability. For the first cohort (July 2006), they each scored half of all the instruments. Only one of them (the lead) was available to score the second cohort.

Once the scores were calculated, analyses were conducted to determine if there was a correlation between developmental level and performance on the Postgraduate Orientation Assessment (POA), a multi-station objective standardized clinical examination (OSCE). In 2006 and 2007 the OSCE stations were informed consent, aseptic technique, cultural communication, geriatrics/pediatrics evidence-based medicine, pain assessment, systems compliance (fire safety), radiograph interpretation, patient safety (order writing) and critical lab values (Lypson, et al., 2004; Janus, et al. 2006). Once the WUSCT scores were derived, Pearson Correlations Coefficients (R) were calculated to determine

whether there were bivariate associations between developmental level and performance on USMLE Step 1, Step 2, and the Postgraduate Orientation Assessment (POA).

Finally, Program Directors who supervise interns (n=14) were provided with detailed information about Kegan’s orders and asked to estimate the developmental level of incoming interns (Appendix 1).

Results

Kegan’s Orders of Consciousness

Ego Development level scores (E levels) were calculated for each intern and mapped to Kegan’s Orders of Consciousness. Mapping revealed that almost half (48%) of the 314 incoming interns were in transition between the third and fourth orders. The rest of the interns were spread among the orders: 1% (4) in the second order, 20% (63) in the third order, 30% (93) in the fourth order, and less than 1% (4) in transition between the fourth and fifth order. None had achieved the fifth order.

Nine of the 14 program directors (64%) responded with their estimates of developmental level of incoming interns. On average, they estimated that 30% were in transition between the third and fourth order. Again, the rest of the interns were estimated by residency program directors to be spread among the orders: on average, 18% in the second order, 30% in the third order, 24% in the fourth order, 10% in transition between the fourth and fifth order, and 7% in the fifth order. Results of both the actual assessment and the estimates from the program directors are presented in Table 2.

Table 2. Results from UM assessment of Kegan’s Order intern placement (N=314 Interns), compared with summary statistics from Residency Directors’ assessment of typical proportions of intern placement (N=9 Residency Directors).

	UM Study of N=314 Interns: Percent of Interns by Order Level	Results from Residency Director Survey N=9 Residency Directors	
		Mean	Standard Deviation
Order 2	1%	18.0%	23.5%
Order 3	20%	30.0%	23.3%

3 to 4 Transition	48%	23.1%	16.9%
Order 4	30%	24.4%	14.0%
4 to 5 Transition	<1%	10.0%	10.5%
Order 5	0%	7.3%	8.9%

Ego Development Level

Although analyses yielded a statistically-significant, positive Pearson correlation between E-level and overall OSCE (POA) score – indicating that those with lower E-level scores tended to have lower OSCE scores, while those with higher E-level scores tended to have higher OSCE scores – the correlation was weak ($R=0.145$, $p=0.01$). We also noted that correlations between Step 1 and the OSCE were significant and slightly stronger ($R=.227$, $p=0.01$); the same was true for Step 2 and the OSCE ($R=.248$, $p=0.01$). Although stronger, we would still consider these correlations to be weak.

The relationship between sex and E-level was statistically significant, with women having higher E-level scores (mean=5.21, SD=0.075, n=129) than men (mean=5.02, SD=0.078, n=185) as calculated using independent samples t-test ($t=2.25$, $df=312$, $p=0.028$).

Discussion

The ACGME core competencies have begun to drive outcomes-based education; in response, program directors are struggling to ensure high quality education at the same time that they are struggling to become proficient with outcomes assessment. These demands for outcomes-based education are occurring simultaneously with increasing pressures on faculty to see more patients and with duty hour restrictions that have reduced time for teaching/learning (White et al.,2006).

Understanding that faculty time with residents has diminished, the ACGME developed core competencies, several of which assume that interns and residents are mature learners who can take increasing responsibility for their own learning, including self-assessing knowledge/skills that need

improvement. In fact, a survey of 50 residency program directors from a variety of disciplines found that 87% felt interns should be able to recognize their own limitations three months into residency, and 97% felt that interns should be able to self-assess and self-educate three months into residency (Langdale, et al., 2003). However, there are significant differences between what faculty members believe residents should be able to do independently related to learning, and what residents believe they can and should do (Li et al., 2009). In particular, interns show little understanding of how to self-assess knowledge and skills, or what self-directed learning means (Li et al., 2009). On an entry OSCE at one institution, interns' self-assessments of performance were thought by the faculty to be "unduly optimistic" (Burch et al., 2005). Also, in a qualitative study exploring competencies that program directors believed fourth year medical students should have (but have not) mastered prior to internship, self-reflection and improvement were most frequently mentioned (Lyss-Lerman, et al., 2009).

We used the WUSCT to assess developmental levels of two cohorts of incoming first year interns to determine what developmental levels they had achieved, and found that only 30% had reached a level (Kegan's fourth order) where they could effectively self-assess (Kegan, 1994). This means that almost 70% of incoming interns were not prepared to meet the requirements of the practice-based learning and improvement core competency and its associated objectives. We also surveyed our residency program directors who indicated that – on average – they believed that almost 42% of incoming interns had reached the fourth order and higher (Table 2). Even beyond the discrepancy between what they estimated and what we measured (42% vs. 30%, respectively), 42% would still mean that 58% of incoming interns are not prepared to meet requirements or expectations. Residency program directors can use this information to define realistic learning expectations within their programs, provide appropriate oversight and feedback to interns and residents, and identify which interns will need additional attention in order to achieve learning goals related to ACGME competencies most effectively.

Interventions designed to help residents acquire effective habits of self-assessment have been shown to be successful in some settings, especially in the context of individual learning plans (ILPs) currently required by a few RRCs (O'Connor et al., 2010). However, many disciplines have yet to adopt ILPs and of those who have, many have not linked any kind of curricular/feedback intervention with them, rendering them meaningless to learners.

Kegan and Loevinger provide evidence-based frameworks within which to understand and quantify how development is linked with acquisition and assessment of knowledge and skills, including the ability to self assess effectively. Others who have done research on self-assessment in the context of self-regulated learning have emphasized the importance of setting personal goals, increasing autonomy in learning, and self-monitoring of progress against goals accompanied by targeted feedback to foster development of higher order skills (White & Gruppen, 2007).

Conclusion

Our study provides evidence that many entering interns are not developmentally prepared to meet certain ACGME competencies (PBLI in particular) effectively, and that other common criteria (USMLE Steps 1 and 2) and performance-based assessments (intern OSCEs) are not sufficient substitutes for determination of self-assessment skills. Developmental level has been linked with ability to self-assess and with higher order cognitive skills necessary for safe and high-quality medical practice. However, definitive pedagogical steps must be taken to assure interns and residents can progress toward higher developmental levels. Integrating development of personal goals and self-assessment practice (ILPs are designed to do this) into programs along with appropriate guidance, feedback and structured opportunities for autonomy have been shown to be effective in promoting development and fostering acquisition of complex cognitive skills, including self-assessment.

Limitations

Although this study was conducted across disciplines, with medical students from over 60 institutions, it was done within only one health system. Similar studies at other institutions could potentially provide additional validation of the findings.

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