

Understanding Gaps in Laser Education in Urology Residency Programs



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| Chapter | Topics Covered |
|---|--|
| 3. Commonly Used Wavelengths in Urology | 3.1 Holmium YAG 3.2 Moses 3.3 Thulium YAG 3.4 Thulium Fiber Laser (TFL) 3.5 Diode 3.6 KTP/Greenlight 3.7 CO2 |
| 4. Commonly Performed Laser Surgeries in Urology | 4.1 Nephrolithiasis Removal 4.2 Urothelial Cancer 4.3 Prostate Issues 4.4 Benign Urothelial Disease: Strictures |
| 5. Application Precautions | 5.1 Characteristics of Target Tissue 5.2 Nearby Structures in Proximity to Target Tissue |

OBJECTIVES:

Urologists frequently use lasers in the treatment of urologic disease, including stones, cancer, and benign entities. At least 7 technologies are commonly used.

We sought to:

1. Understand gaps in knowledge surrounding laser technologies
2. Inform decisions around the annual Residents Skills Course and overall resident education

METHODS:

- To assess laser knowledge, 2 surveys were created: one directed at urology residents, the other at urology faculty
- Both surveys were administered via QR code at a weekly Grand Rounds conference to all NE Residency Programs
- Responses were anonymous
- Respondents were encouraged to give their best guess and to not look up any information or confer

| RESULTS: | Resident (n=72) | Attending (n=62) |
|--|---|--|
| How often should laser curricula be taught? (in a 5-year cycle) | 2-3 times => 42% of responses 5 times => 56% of responses | 2-3 times => 58% of responses 5 times => 18% of responses |
| How important is laser physics education? | Average: 58 Range: 7-100 (scale 1-100) | Average: 70 Range: 7-100 |
| How important is laser safety education? | Average: 74 Range: 14-100 (scale 1-100) | Average: 84 Range: 8-100 |
| Do you know where to look for basic information on laser physics? | 31% => not at all 46% => yes, small degree 21% => yes, moderate degree 2% => yes, large degree | 14% => not at all 35% => yes, small degree 52% => yes, moderate degree 10% => yes, large degree |
| How likely are you to seek out knowledge about laser physics on your own? | 14% => not at all likely 63% => somewhat likely 23% => very likely | 26% => not at all likely 42% => somewhat likely 32% => very likely |
| Re-assessment of knowledge after survey | 73% => lower than original score | 58% => lower than original score 36% => keep the same |

PROPOSED LASER CURRICULUM:

| Chapter | Topics Covered |
|--------------------------------|---|
| 1. Laser Physics | 1.1 Laser Modes 1.2 Laser Mediums 1.3 Laser Chromophores 1.4 Laser Principles 1.5 Laser Physics Variables |
| 2. Laser Safety Precautions | 2.1 Types of Injuries: Eye Injury and Burn 2.2 PPE: Personal Protective Equipment 2.3 NOHD: Nominal Optical Hazard Zone |

SAFE USE OF LASER STANDARDS 2024 (z136.3):

1. Training must follow defined standards and federal, state, and local requirements.
2. Training will include understanding of all procedures required for establishing and maintaining a safe environment during laser use and shall be specific to the lasers used at the facility.
3. Refresher training should be provided at intervals no less frequently than every 5 years
4. All training activities shall be documented and the documentation retained on file. Laser safety training shall be required.
5. Personnel shall have sufficient knowledge, training and experience to ensure that laser health care applications are performed safely.

CONCLUSIONS

- Gaps in knowledge surrounding laser technologies are significant.
- Urology residents and attendings acknowledge deficiencies, yet only 25 – 32% are very likely to seek information on their own
- While faculty rate their comfort with teaching laser physics moderately high, their performance with half of the technologies was poor
- Standardized laser education curricula, frequently updated and delivered at least twice during a 5-year training cycle, should improve:
 - Overall knowledge
 - Engage physicians in laser safety
 - Reduce risk of injury to patients and operating room personnel.

Self-Assessed Knowledge With Physics of Each Technology (scale 1-100)

| | Resident (N=72) | Attending (N=62) |
|---------------------------|-----------------|------------------|
| Holmium | 35 | 59 |
| Moses | 30 | 38 |
| Greenlight/KTP | 27 | 39 |
| Thulium | 23 | 30 |
| Thulium Fiber Laser (TFL) | 22 | 32 |
| Diode | 14 | 17 |
| CO2 | 14 | 30 |

Percentage of Residents or Attendings Correctly Matching Laser Wavelength with Chromophore

| | Resident (N=72) | Attending (N=62) |
|-----------------------------------|-----------------|------------------|
| Holmium (water) | 65% | 64% |
| Moses (water) | 67% | 64% |
| Greenlight/KTP (hemoglobin) | 53% | 72% |
| Thulium (water) | 49% | 48% |
| Thulium Fiber Laser (TFL) (water) | 51% | 48% |
| Diode (hemoglobin and water) | 27% | 30% |
| CO2 (water) | 40% | 15% |