Azienda Ospedaliero Universitaria Pisana
Dipartimento di Gastroenterologia
e Malattie Infettive
U.O. Chirurgia Generale
Direttore: Dott. Piero Buccianti

Collaborazione:

6° Edizione del Corso

CHIRURGIA LAPAROSCOPICA DELLA PARETE ADDOMINALE

7-8-9 OTTOBRE • PISA

Johnson&Johnson
MEDICAL S.P.A.

Dr. Francesco Di Marzo

Dirigente Medico UO CH Gen "Zona Lunigiana"

ASL1 Massa Carrara

Svolge la sua attività formativo-professionale presso le Università di Roma "La Sapienza" e "Tor Vergata". Si dedica dai primi anni duemila alla chirurgia laparoscopica e dal 2011 si interessa di addestramento dei giovani chirurghi con la creazione di un percorso dedicato.

Selezionato dalla YEES Hdemy nel 2012, è attualmente consulente scientifico per Nestlè Healthscience e KCI.

Relatore nel 2013 a Monteriggioni e a Pisa in congressi regionali sulla chirurgia della parete addominale e nel 2014 all'ACOI regionale Toscana; da alcuni mesi è consulente del prof. Bisciotti (Responsabile recupero infortunati FC Internazionale) nell'ambito della *Groin Pain Sindrome*.

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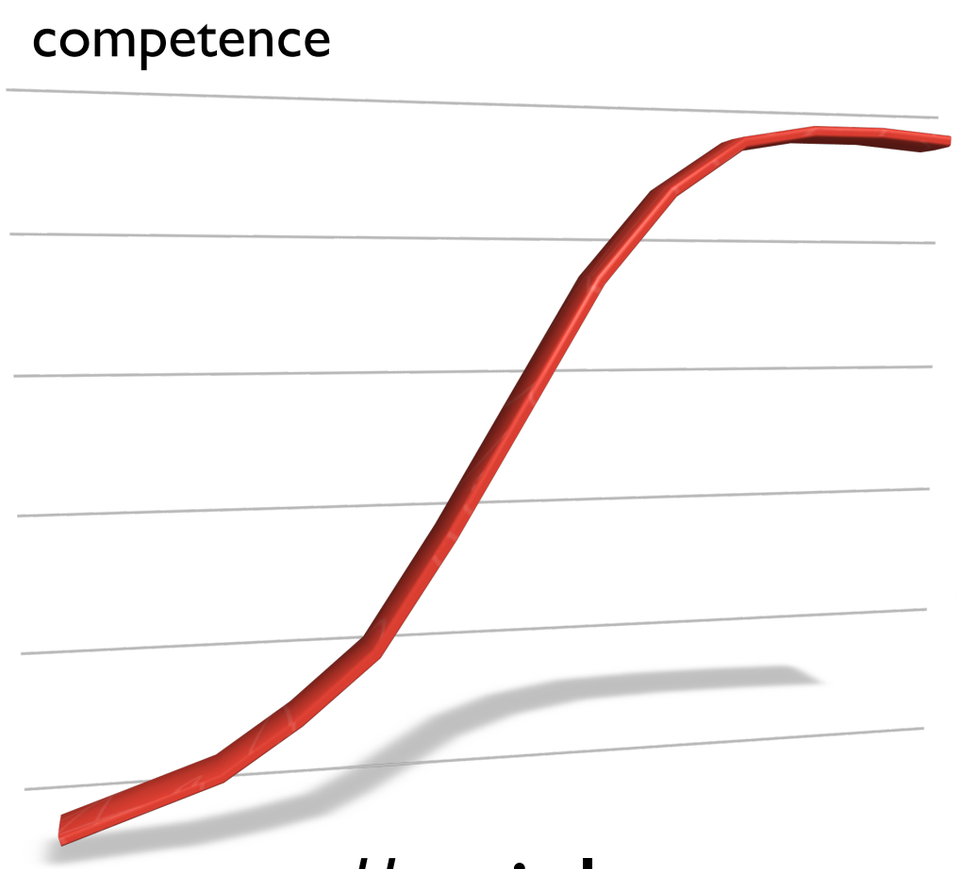
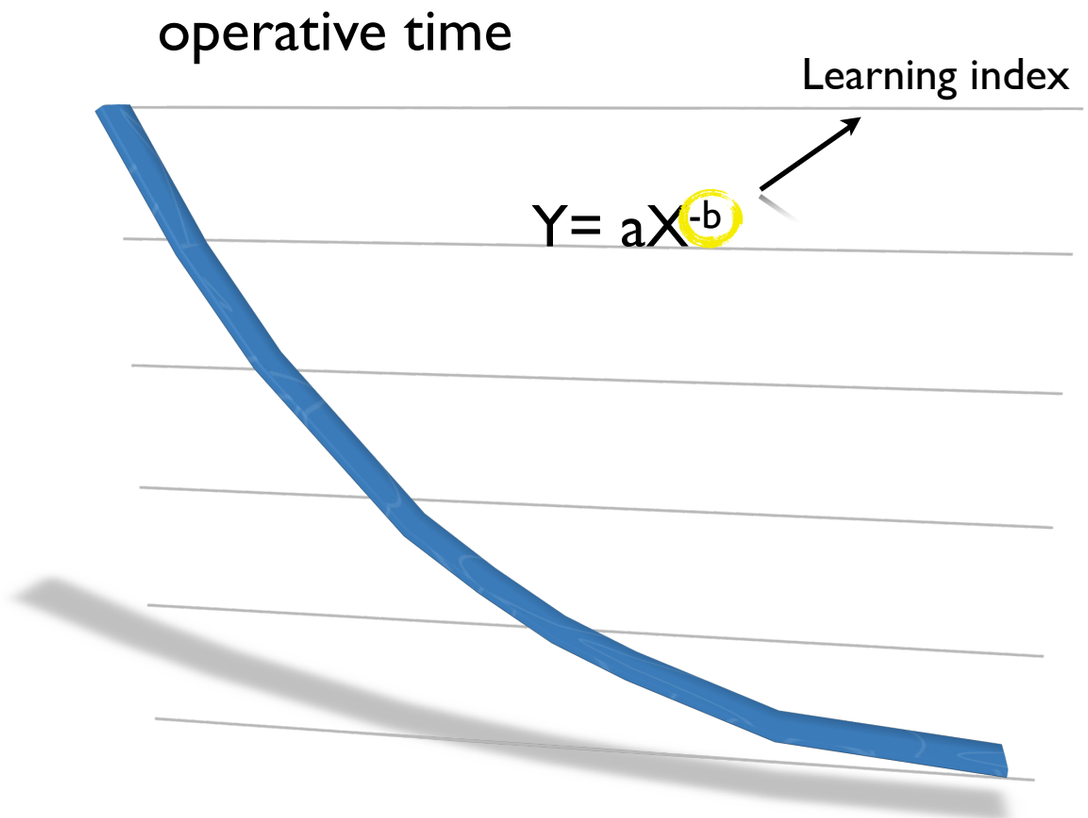
LEARNING CURVE IN CHIRURGIA

Dott. Francesco Di Marzo

Learning curve



trials



procedures

The Functional Form of a Learning Curve

$$y = aX^{-b}$$

X = cumulative # of cases

y = time required to peform last task/procedure

a = time required to peform 1°task/procedure

b = a value related to the percentage associated with the Learning Curve

(Learning index)

Relationship Between *b* and *p* and % associated with the Learning Curve

b	0.000	0.074	0.152	0.234	0.322	0.415	0.515	0.621	0.737	0.862	1.000	1.322	1.737	2.322	3.322
p	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	40%	30%	20%	10%

$$y = aX^{-b}$$

Ex. 1

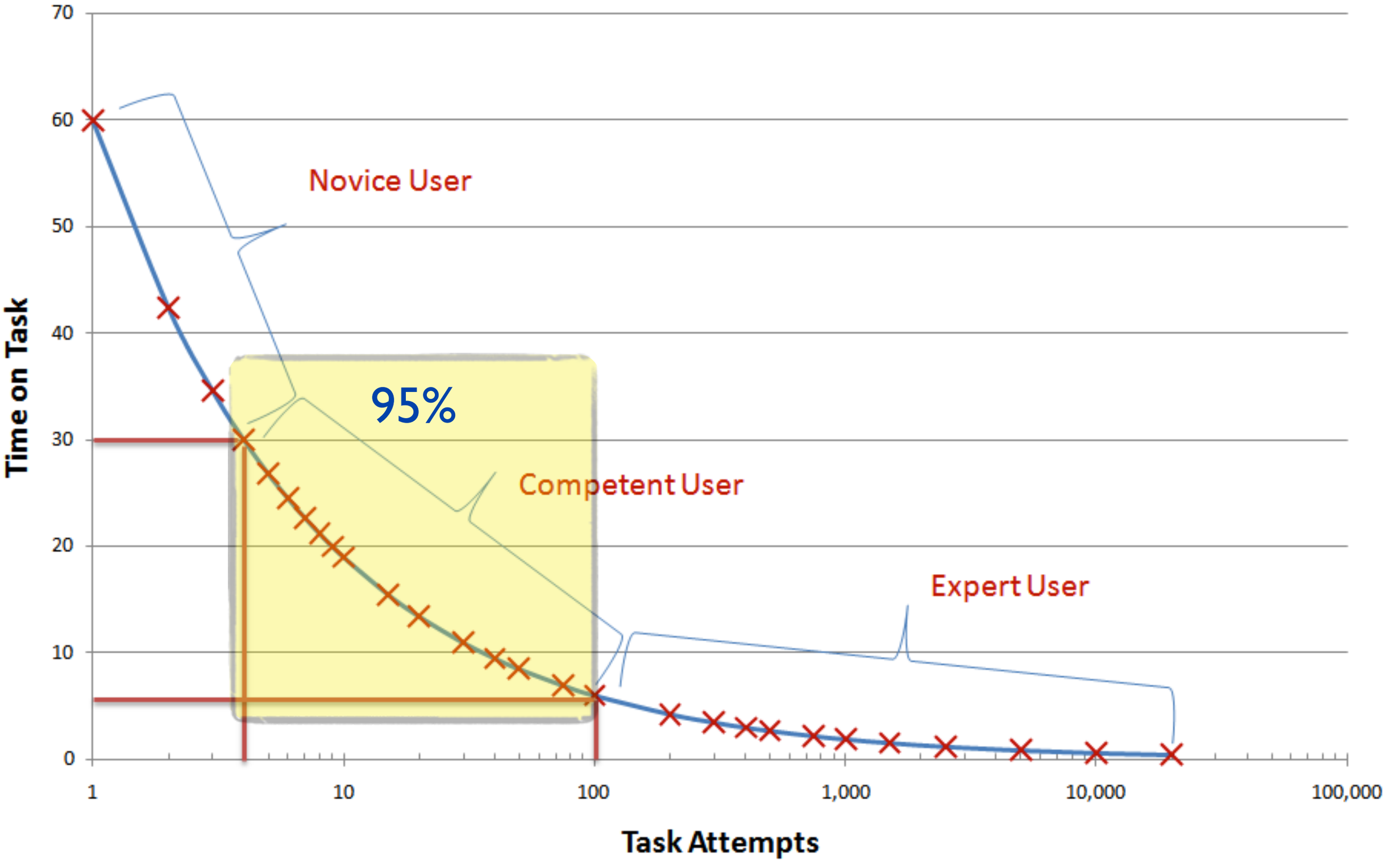
$y = 100*100^{-0} = 100* 1/1= 100$

Ex. 2

$y = 100*100^{-1} = 100* 1/100= 1$

Experience Curve

(50% Curve)



Effect of Annual Growth Rate

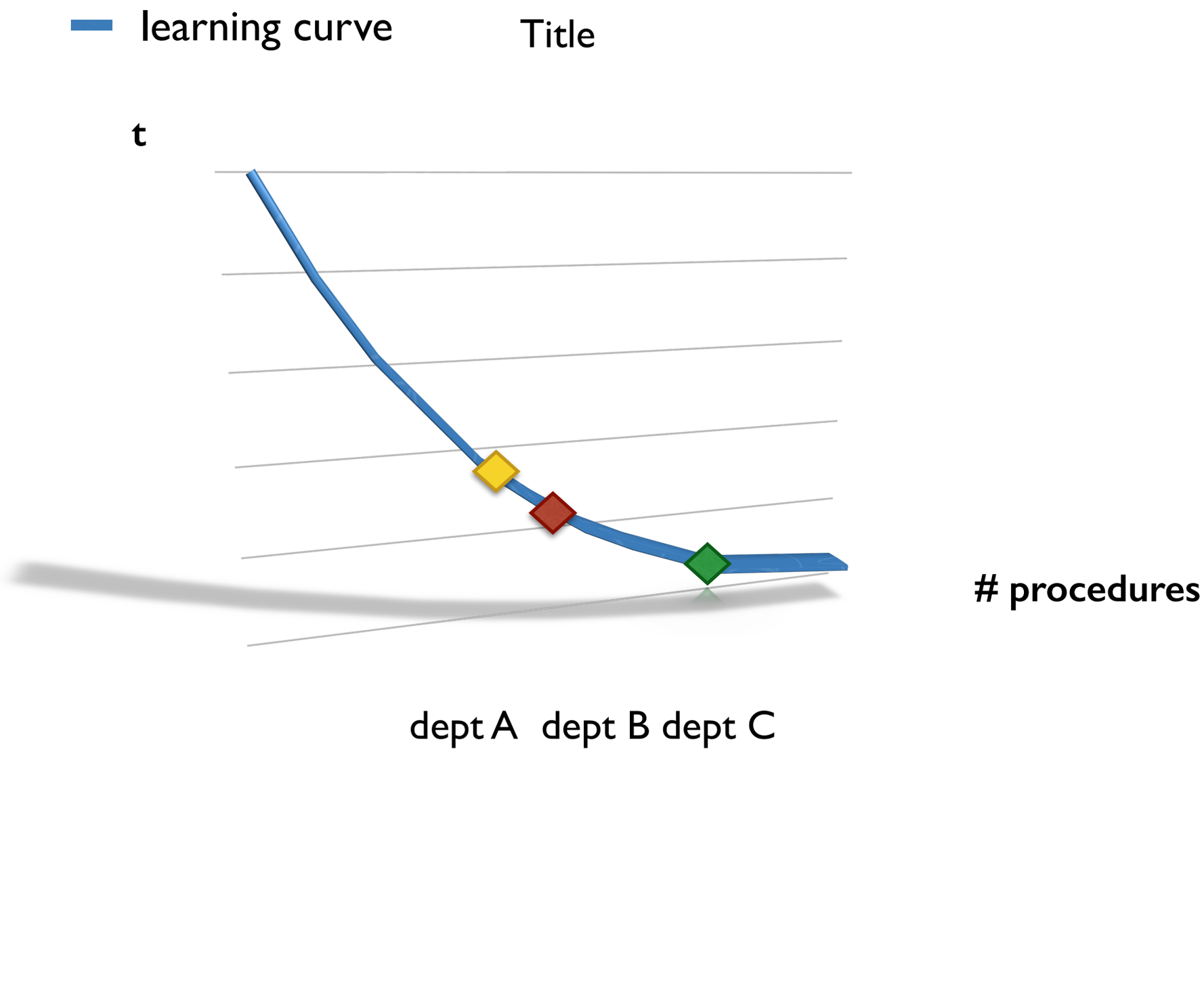
EXAMPLE:

- 3 Surgical Departments have the same 80% learning curve: $y=100x^{-0.322}$
- During Year 1, all 3 Departments performed 5000 procedures
- The 3 Departments have respective annual growth rates in patients of 5%, 10%, and 20%
- Compare the three departments at the end of Year 4

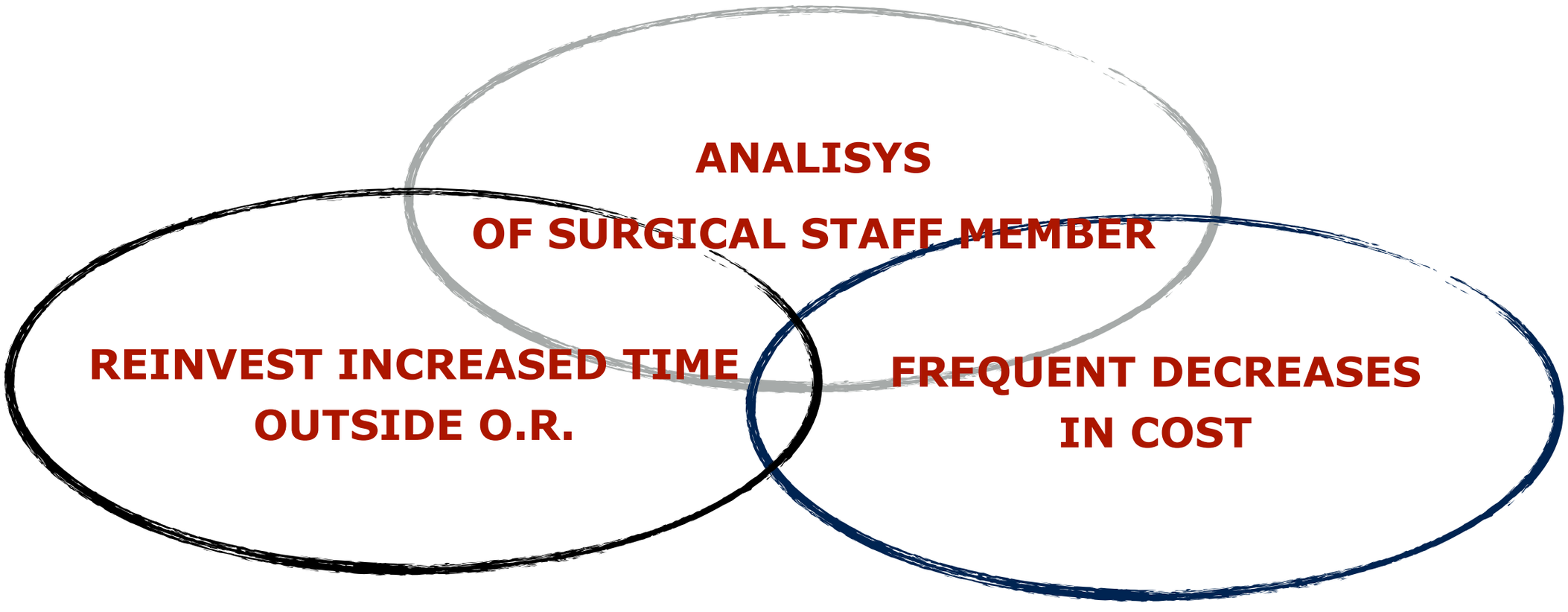
DEPT	Annual Growth Rate in Procedures	Cummulative # cases at End of Year 4 x	Hours Required to Perform Most Recent Procedure $y = 100\,x^{-0.322}$
A	5%	$x = [1.00+(1.05)+(1.05)^2+(1.05)^3](5000) = 15,764$	4,453
B	10%	$x = [1.00+(1.05)+(1.05)^2+(1.05)^3](5000) = 16,551$	4,384
C	20%	$x = [1.00+(1.05)+(1.05)^2+(1.05)^3](5000) = 18,202$	4,252

Conclusion?

Effect of Annual Growth Rate



Strategic Applications of a Learning Curve



Learning Curve - Long and steep

- ✓ Fewer degrees of freedom (4)
- ✓ Fulcrum effect / Stiffness
- ✓ 2D imaging (depth perception / spatial orientation)
- ✓ Decreased ergonomics (ambidexterity)
- ✓ Less tactile feedback
- ✓ Impaired hand-eye coordination

Learning Curve - Unsteadiness

- ✓ Structured training program
- ✓ Trainee's laparoscopic experience
- ✓ Mentoring vs proctoring
- ✓ Trainer's expertise and motivation
- ✓ Forgetting factor D R Towill Int J of Operations and production management 5, no.2 (1985)

NAVAL TRAINING EQUIPMENT CENTER
ORLANDO, FLORIDA 32813

TAEG REPORT 2
1972

ANALYSIS OF THE TRANSFER OF TRAINING, SUBSTITUTION AND FIDELITY OF SIMULATION OF TRAINING EQUIPMENT

TRAINING ANALYSIS and EVALUATION GROUP

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R & D
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13 ABSTRACT
This report summarizes, evaluates and synthesizes the data on the training value of training devices. The report discusses the issues of substitution of some operational training time by training devices and the relationship between training effectiveness and cost (fidelity of simulation).

1972

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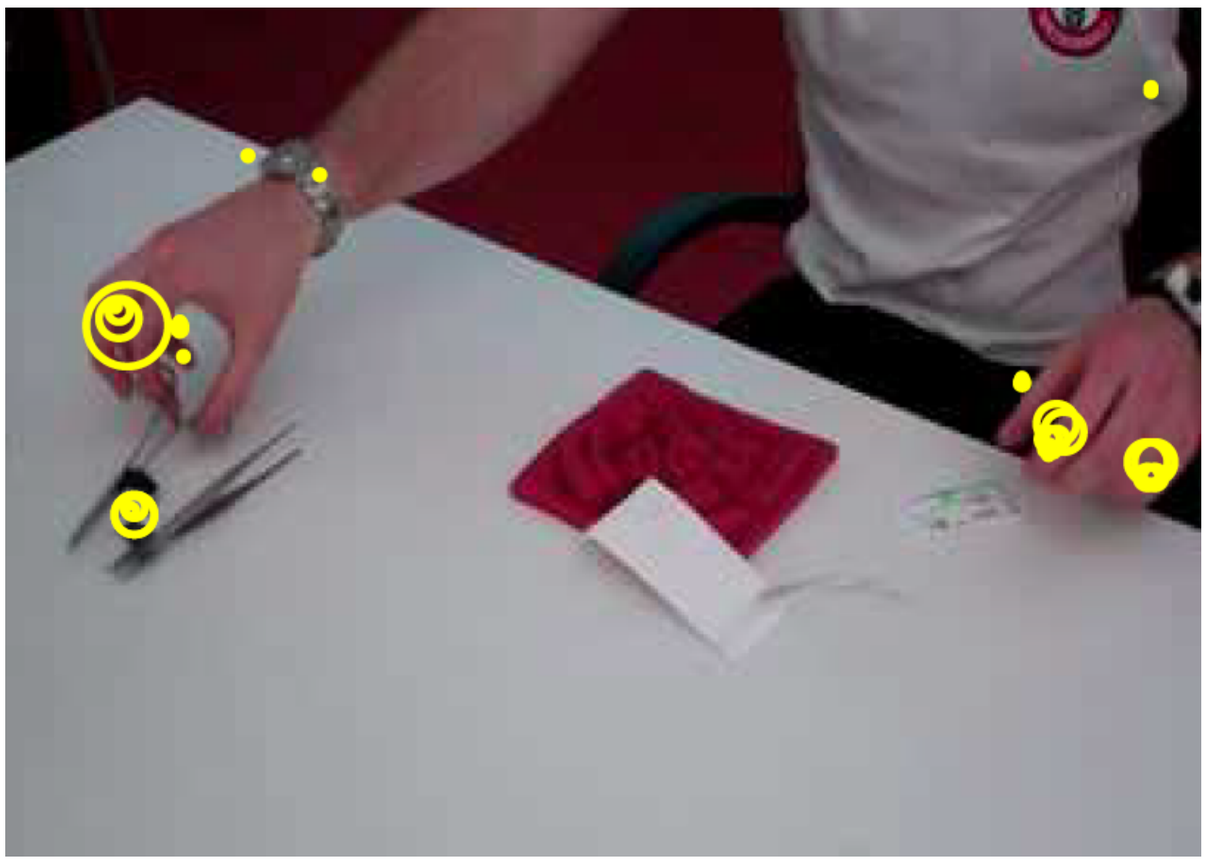
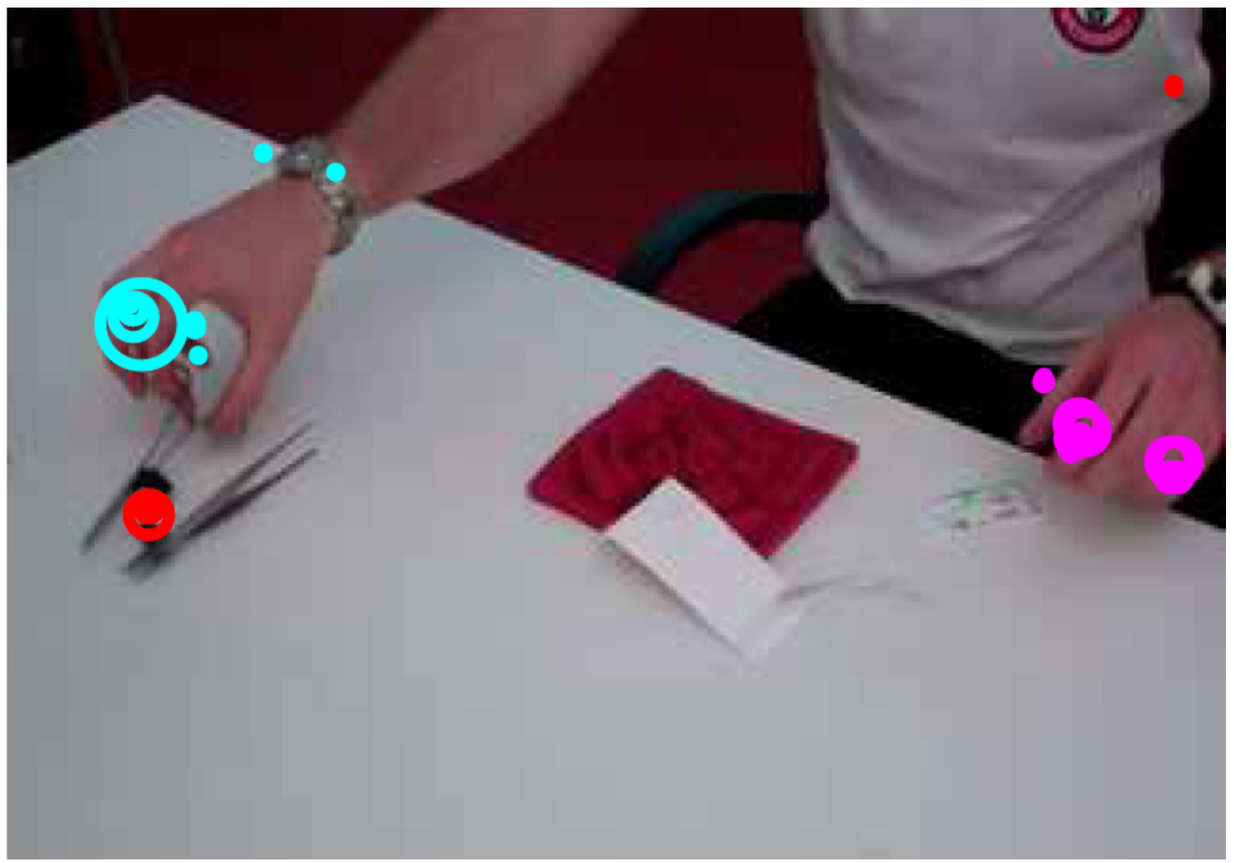
UNCLASSIFIED
Security Classification

Reference and LOE	Participants and simulators	Assessment procedure	Results
Simulation training *versus* patient-based training			
Franzeck *et al.*[28] (2012) Switzerland RCT II	Medical students IG 12; LAP Mentor™ and ProMIS™ surgical hybrid simulator CG 12; traditional training in OR	Camera navigation in OR during procedure	No significant difference between groups in any parameter after training: organ visualization ($P = 0{\cdot}45$), horizon alignment ($P = 0{\cdot}08$), time to completion ($P = 0{\cdot}12$) and correct scope rotation handling ($P = 0{\cdot}60$). Participants in both groups spent equal time actually training on camera navigation ($P = 0{\cdot}20$). However, CG spent significantly more overall time in OR than IG spent in skills laboratory ($P < 0{\cdot}01$)
Simulation training as part of comprehensive curriculum in additional to residency training *versus* conventional residency training			
Palter and Grantcharov[29] (2012) Canada RCT II	General surgery residents PGY 2–4 IG 9; curriculum including simulation training on LapSim® VR simulator CG 9	Right hemicolectomy	IG attained higher level of technical proficiency than CG: OSATS score ($P = 0{\cdot}030$), procedure-specific score ($P = 0{\cdot}122$). IG residents able to perform more operative steps than CG residents ($P = 0{\cdot}021$)
Palter *et al.*[30] (2013) Canada RCT II	General surgery residents PGY 1–2 IG 9, curriculum including simulation training on LapSim® VR simulator and on FLS Training Box simulator CG 9	Cholecystectomy	IG outperformed CG in the first 4 laparoscopic cholecystectomies measured on OSATS rating scale ($P = 0{\cdot}004$, $P = 0{\cdot}036$, $P = 0{\cdot}021$, $P = 0{\cdot}023$). No significant difference in score between groups for 5th procedure ($P = 0{\cdot}065$)

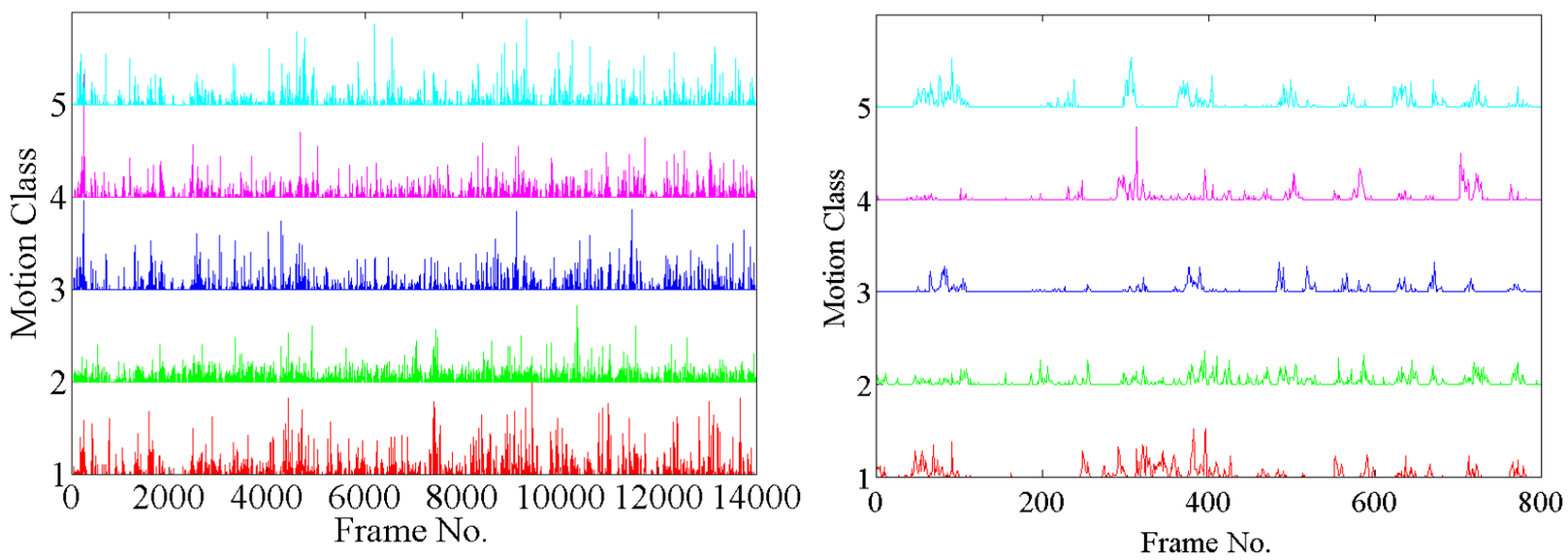
2014





Y Sharma et Al. "Automated surgical OSATS prediction from videos", Georgia Inst Tech. 2014, International Symposium on Biomedical Imaging

2014



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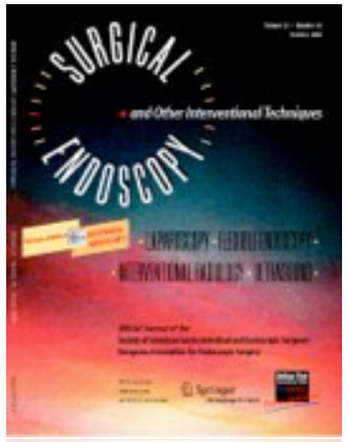
2014, International Symposium on Biomedical Imaging

SIMULATION LAB

laparoscopy laboratory

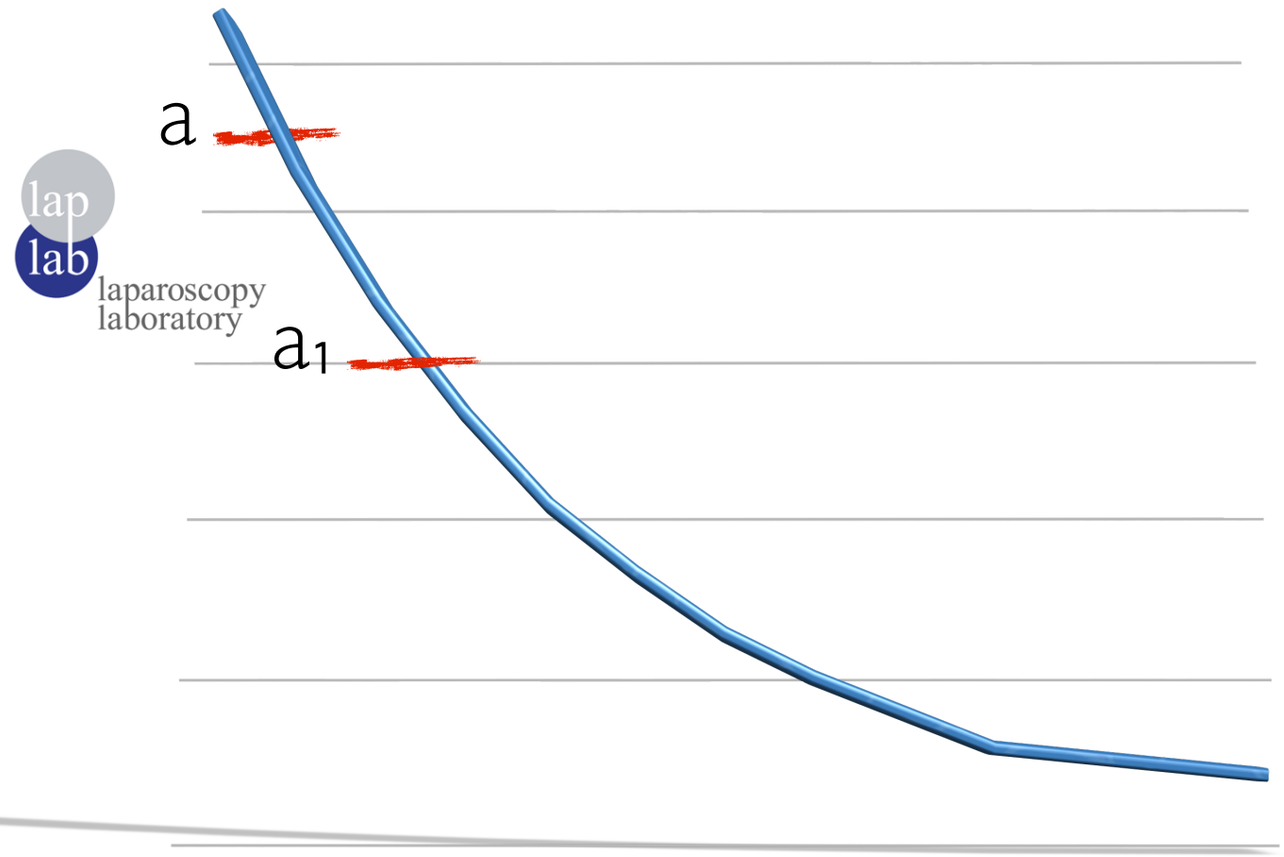
FLS_fundamentals of laparoscopic surgery

SAGES_society of American gastrointestinal and endoscopic surgeons

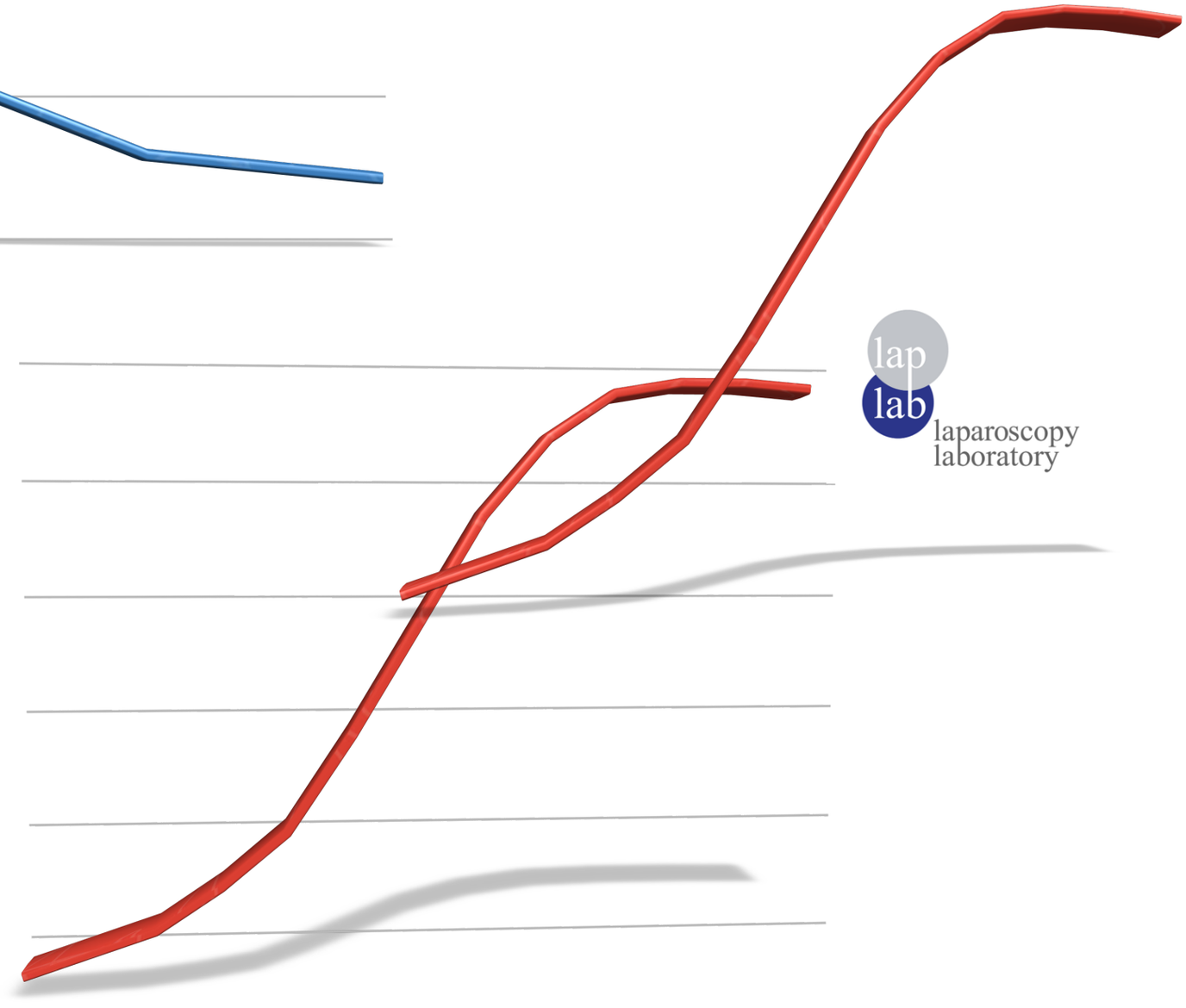


"Trends and results of the first 5 years of fundamentals of laparoscopic surgery (FLS) certification testing"
Okrainec A, Soper NJ, Swanstrom LL, Fried GM B. Surg Endosc. 2011

"Simulation based mastery learning improves patient outcomes in laparoscopic inguinal hernia repair: a randomized controlled trial"
Zendejas B, et al. Ann Surg. 2011 Sep; 254(3): 502-9



- ✓ Students
- ✓ Residents
- ✓ Novice surgeons
- ✓ Competent surgeons
- ✓ Expert surgeons



"Preoperative warm-up effect"

Kahol et al. American College of Surgeons

vol. 208, n. 2 Feb 2009

Mucksavage et al. J Endouro 2012; 26(7):

765-68

"If we could first know where we are, and whither we are drifting, we could better judge what to do and how to do it." - Abraham Lincoln

keep in touch fdimarzo@yahoo.com