

DA VINCI

The Surgeon Robot

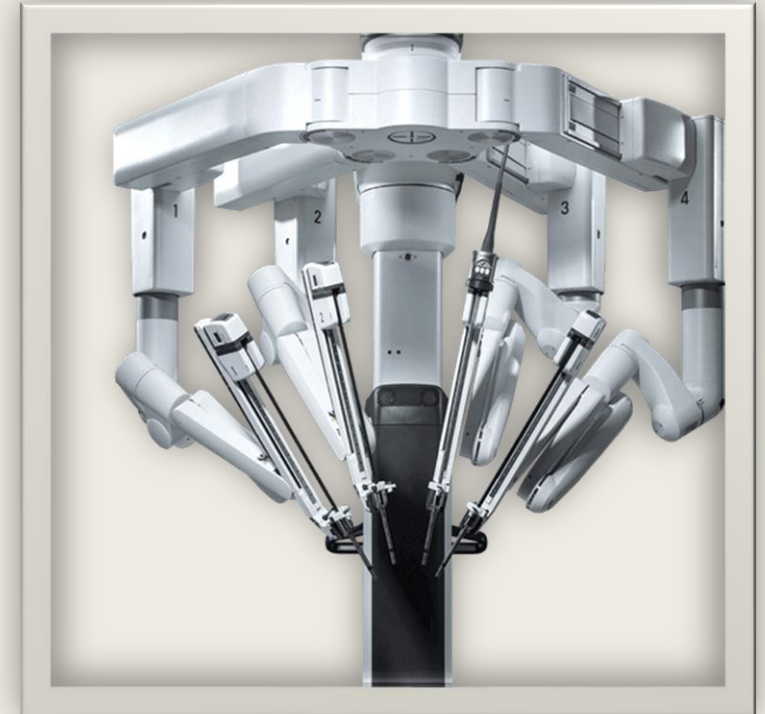
Student Name	Student ID	Topic
Mihaela Ganchev (Group Leader)	2013873	Introduction & Challenges before introducing Modern Technology
Inga Oprea	2011632	Insights of Modern Technology introduced
Denisa Maria Vodnar	2011076	Impacts of Modern Technology
Nicoleta-Claudia Pagnejer	2009639	Background of the Organization & Conclusion
Ana Sofia Hernández Amaya	2008116	Lessons drawn from the case study

Name of the Lecturer : **Mr. Modak Koushik**

Module: **Digital Skills and Research Method (BMSW4003)**

University of Wales Trinity Saint David (London Campus)

Date of Presentation : **10th December 2020**



DA VINCI

The Surgeon Robot

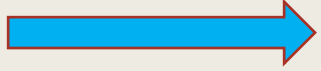
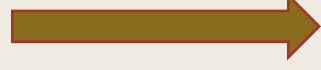
Table of Contents

➤ <u>Introduction</u>	Mihaela Ganchev
➤ <u>Background of the Organization</u>	Nicoleta-Claudia Pagnejer
➤ <u>Challenges before introducing Modern Technology</u>	Mihaela Ganchev
➤ <u>Insights of Modern Technology Introduced</u>	Inga Oprea
➤ <u>Impacts of Modern Technology</u>	Denisa Maria Vodnar
➤ <u>Lessons drawn from the case study</u>	Ana Sofia Hernández Amaya
➤ <u>Conclusion</u>	Nicoleta-Claudia Pagnejer
➤ Reference	
➤ Q&A	

DA VINCI

The Surgeon Robot

INTRODUCTION

-  Main problems/solutions of robotic surgery + examples
-  Background of the London Bridge Hospital
-  The robot itself
-  Impacts, benefits, advantages and disadvantages
-  What we learned from the Da Vinci Robot

Da Vinci

- Different Instruments
- Robot assisted surgery
- Performance through the console *About Da Vinci Systems (Intuitive)*₃

DA VINCI The Surgeon Robot

Background of the Organization

London Bridge Hospital

- ❑ has been delivering high quality healthcare since 1986 (NHS, 2010).
- ❑ is a private hospital offering high standards (NHS, 2010).
- ❑ London Bridge Hospital is part of HCA Healthcare UK from 2000 .
- ❑ Is in the heart of London, with easy access overlooking the River Thames and Tower Bridge.
- ❑ Largest private hospitals in the UK, famous for its medicine and care across the world. (NHS, 2010).



DA VINCI The Surgeon Robot

Background of the Organization

London Bridge Hospital

Their aim:

- ❖ most comfortable and pleasant stay.
- ❖ improve working condition and care.

The success of the hospital is their **goal** on long and short term. (Richard, 2017)



DA VINCI

The Surgeon Robot

Challenges before introducing Modern Technology

Open Surgery

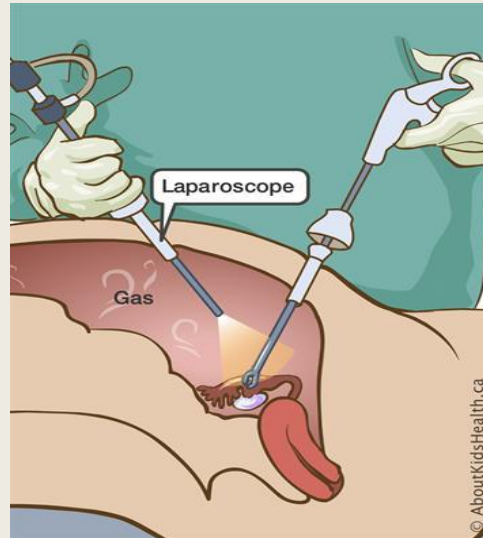
- Lower levels of precision
- Not so flexible



Laparoscopic Surgery

- Diagnose and treat problems in the reproductive organs

Laparoscopy (healthline,2018)



Robotic Surgery

- Precise
- Smaller scars



DA VINCI
The Surgeon Robot

Challenges before introducing Modern Technology

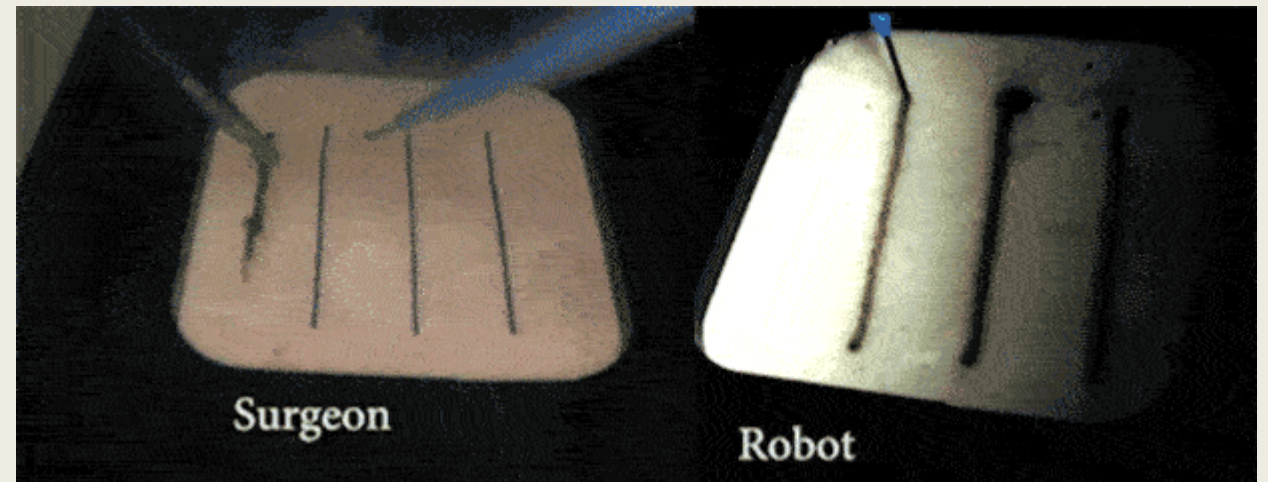
Surgeons

vs.

STAR Robot



Robot surgeon performs flesh-cutting tasks and pseudo-tumor removal (IEEE Spectrum, 2017)



In Flesh-Cutting Task, Autonomous Robot Surgeon Beats 7 Human Surgeons (IEEE Spectrum, 2017)

Challenges before introducing Modern Technology

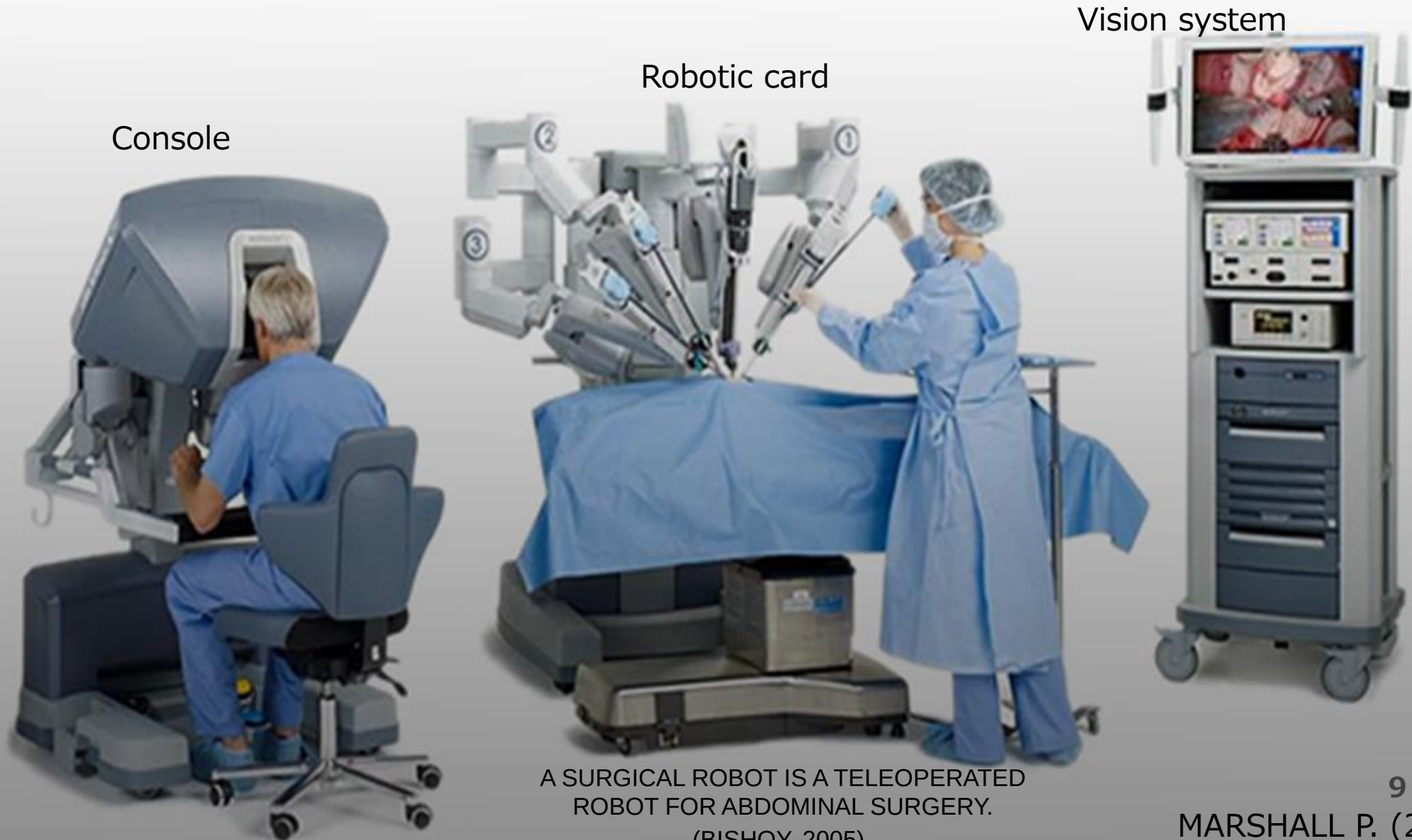
LAPAROSCOPIC PROBLEMS

- Unstable camera
- Counterintuitive moves
- Low degrees of freedom
- Stay for many hours
- At least 2 surgeon

ROBOTIC SOLUTIONS

- Camera is hold by the robotic arm
- Intuitive movements
- Freedom
- Sitting
- One surgeon can control 4 robotic arms at the same time

Da Vinci robot – Insights of modern technology introduced.



A SURGICAL ROBOT IS A TELEOPERATED
ROBOT FOR ABDOMINAL SURGERY.

(BISHOY, 2005).

DA VINCI The surgeon robot

Insights of the modern technology introduced



1. THE SURGICAL CONSOLE = *BRAIN OF THE SYSTEM* (HARDWAR).

- ❑ - STUDIO VIEWER – THREE-DIMENSION, HIGH-DEFINITION VIEW (INFRASENSORS WITH SURGEON HEAD).
- ❑ - THE INSTRUMENT CONTROLLERS.
- ❑ - FIVE - FOOT CONTROL PEDALS. (PALEP,2009).

DA VINCI The surgeon robot

Insights of the modern technology introduced

INSTRUMENT CONTROL (360-DEGREE RANGE OF MOTION).

FOOT CONTROL (FIVE - FOOT PEDALS):

- INSTRUMENTS
- CAMERA
- TELESCOP VISION
- BIPOLAR COAGULATION
- MONOPOLAR CAUTERY(PALEP, 2009).

ADDITIONS TO THE SYSTEM:

- ❖ AUDIO INTERCOM SYSTEM,
- ❖ ENDOSCOPIC CARDIAC STABILIZER,
- ❖ ULTRASONIC INSTRUMENTATION,
- ❖ THE GYRUS PLASMA KINETIC DISSECTOR (PALEP, 2009).



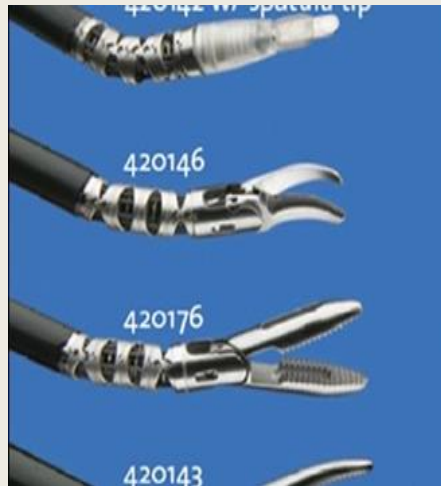
DA VINCI The surgeon robot

Insights of the modern technology introduced

•**2. ROBOTIC CART** (APP 544 KG,
ON A WHEEL - BASE) - FOUR ROBOTIC ARMS.

•**ENDOWRIST** WITH MICROARTICULATIONS.
(7 DEGREES OF FREEDOM). (PALEP,2009).

•**3. INSITE VISION SYSTEM** (EYES OF THE SYSTEM) - 24
INCHES LCD SCREEN, TOUCH SCREEN.(PALEP,2009).



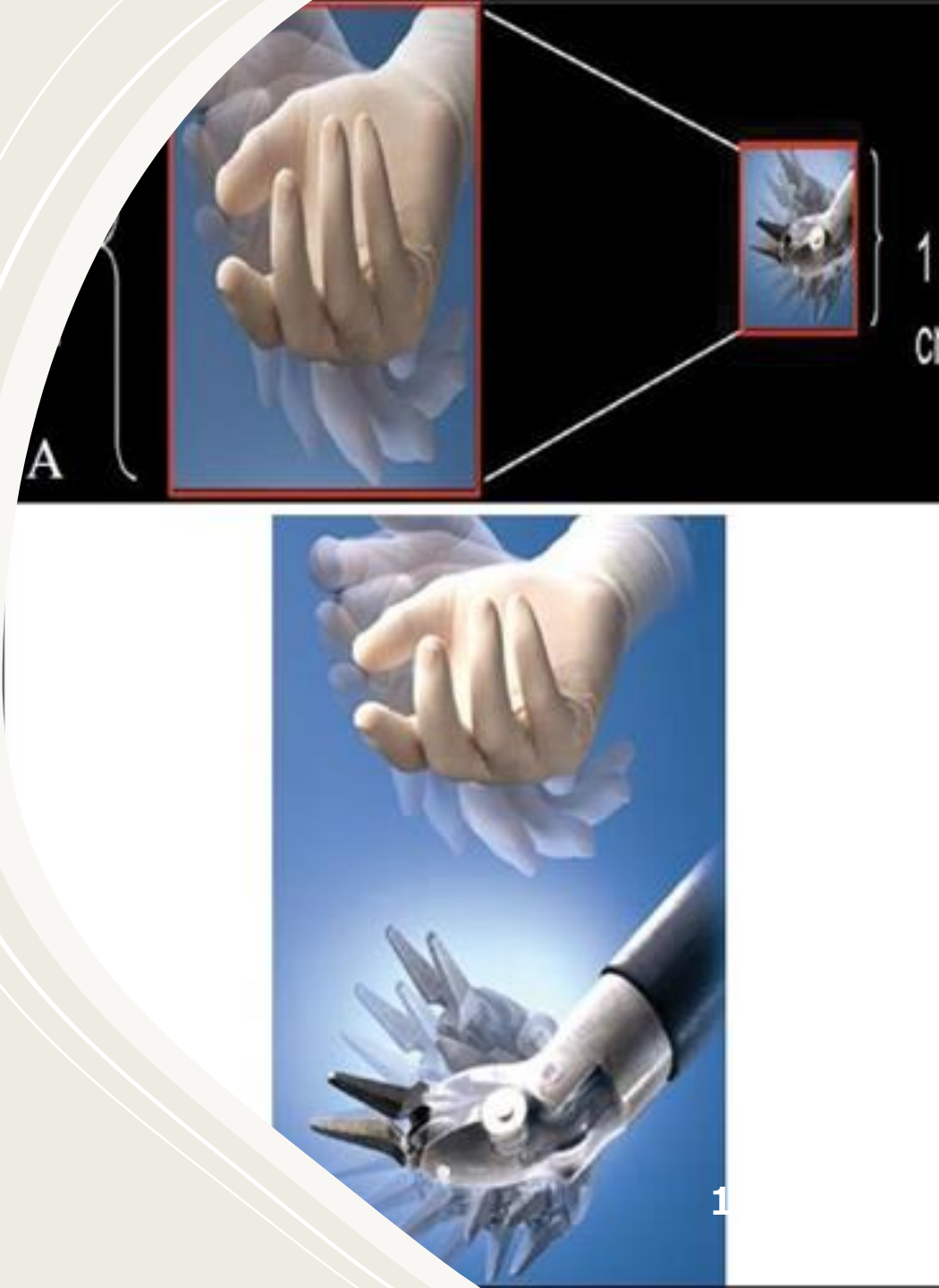
DA VINCI The surgeon robot

Insights of the modern technology introduced

SETUP PROCEDURE.

1. THE SURGEON ARE SCRUBBED – TROCARS PLACEMENT.
2. THE ROBOTIC ARMS ARE DRAPED.
3. STANDBY MODE.
4. PATIENT POSITIONING.
5. ROBOTIC ARMS ATTACHED.
6. THE SURGEON IS OPERATING THROUGHOUT THE COUNCIL (SINGLE SURGEON IS CAPABLE TO MANIPULATE 4 ARMS).
7. CLOSE THE WOUNDS AND THE TROCAR INCISIONS.(PALEP, 2009).

`A LARGE OPERATING ROOM IS ESSENTIAL TO HOUSE THE ROBOT`.
(PALEP, 2009).

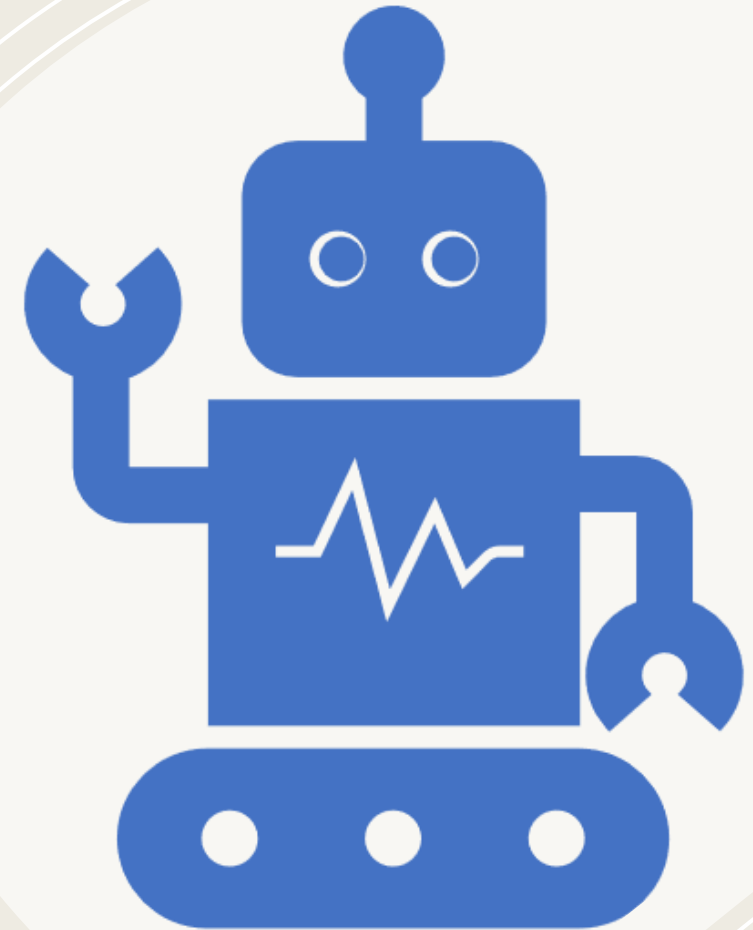


DA VINCI

The Surgeon Robot

Impacts of modern technology of Robotic Surgery

- The presentation about Robotic Surgery it is also to review on the impacts of modern technology used in the medical arena, especially for Robotic Surgery.
- In the next slides of the presentation we will talk about the benefits of the Robotic Surgery, advantages and disadvantages.



DA VINCI
The Surgeon Robot

Impacts of modern technology of Robotic Surgery

Benefits of Robotic Surgery



1.Reduced pain and discomfort.



2.Faster recovery time.



3.Shorter hospitalization.



4.Reduced risk of infection.



5. Minimal scarring.



6. Reduced blood loss and transfusions.

DA VINCI

The Surgeon Robot

Impacts of modern technology of Robotic Surgery

Advantages of Robotic Surgery

Smaller Incisions and Less Trauma

Higher Surgical Accuracy

Reduced Surgeon Fatigue

DA VINCI

The Surgeon Robot

Impacts of modern technology of Robotic Surgery

Disadvantages of Robotic Surgery

The Expense of Surgery

Movement Latency

The Risk or Fail of the Robotic Surgery

DA VINCI

The Surgeon Robot

Impacts of modern technology of Robotic Surgery

Compared to traditional surgery

- Robot Surgery gives the surgeon better control over the surgical instruments and a better view of the surgical site, compared with other minimally invasive surgery approaches.
- Compared to human assistance, robotic surgery controls laparoscopic camera and the movements .

DA VINCI

The Surgeon Robot

Lessons drawn from the case of study.

Differences: Traditional and Modern Technology.

MODERN TECHNOLOGY	TRADITIONAL TECHNOLOGY
• Low blood loss. • Small incisions. • Fine and precise movements. • Increased visibility • More expensive. • Soften the levels of force applied by the surgeon.	• High blood loss • There may be larger incisions. • They must be very precise. • Lower visibility • Cheapest than M.T. • There may be random movements.



DA VINCI

The Surgeon Robot

Lessons drawn from the case of study.

Differences: Traditional and Modern Technology.

Experienced surgeons in good health
are needed for
TRADITIONAL TECHNOLOGY

Traditionally trained surgeons **are** needed
for
MODERN TECHNOLOGY,
but they train for a long time and
practice for these processes.



DA VINCI

The Surgeon Robot.

Lessons drawn from the case of study.

Importance of the Modern Technology for the organization.

- Patients' recovery.
- Great reputation.
- Train workers to new technologies



The da Vinci Surgical System

"These new instruments can move in a way that my hands cannot. This is the new gold standard."

Mr Roberto Casula

Consultant Cardiothoracic Surgeon



DA VINCI

The Surgeon Robot

Lessons drawn from the case of study.

Consequences of not using M.T. in the organization.

- High risk operations.
- Stop being efficient.
- Low quality of customer service.
- There may be a deficit in all the senses.

Future direction for this technology.

- Surgeons are anticipating the development of *long-distance operations* and *tele-medicine*. Where a doctor will be able to operate a patient in a different city or even another continent.
- single-incision port.



DA VINCI The Surgeon Robot

Conclusion:

- ❖ The future of robotic surgery is nearly capable to accomplish medical procedure.
- ❖ The technology is advanced, and the next generation will have medical robotics.
- ❖ Next level will be to remove totally the surgeons from the procedure.
- ❖ Medical robotics is now reducing the cost of healthcare by delivering surgical and other assistance to hospitals, minimising human error, streamlining operating theatres, reducing operating time, and crucial, freeing up personnel for more critical matters.



DA VINCI The Surgeon Robot

References

-
- Basics of Robotic Surgery: Da Vinci Si HD Surgical System Instructional Video. https://www.youtube.com/watch?v=EKqYt_We4fU (accessed 08.10.2020).
 - Bishoy, M.(2005),` Robotic Surgery: Applications, Limitations, and Impact on Surgical Education`, Medscape General Medicine, available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1681689/> (accessed 01,11,2020). 7(3): 72.
 - Business Insider, Jennifer Polland, (2012)"Watch: This Robot Is Poised To Change Surgery Forever. Available at: <https://www.businessinsider.com/the-future-of-robotic-surgery-2012-7?r=US&IR=T> (Accessed at: 5 December 2020).
 - Corcione, F., Esposito, C., Cuccurullo, D. et al. Advantages and limits of robot-assisted laparoscopic surgery: preliminary experience. Surg Endosc 19, 117–119 (2005). <https://doi.org/10.1007/s00464-004-9004-9>(accessed 01.11.2020).
 - DOVEPRESS, Cui, Li, Xu, Wang, Sun, Huirong Xu, Zengjun Li, Yanlai Sun (2017) "Robot-assisted versus conventional laparoscopic operation in anus-preserving rectal cancer: a meta-analysis", 22 September. Available at: <https://www.dovepress.com/robot-assisted-versus-conventional-laparoscopic-operation-in-anus-pres-peer-reviewed-article-TCRM>. (Accessed on 24 November 2020).
 - Expansión (2017) "Todo lo que debes saber sobre Da Vinci, el robot quirúrgico", 15th April. Available at: <https://www.expansion.com/tecnologia/2017/04/15/58f24ada22601d67308b460b.html>. (Accessed on 24 November 2020).
 - Felger JE, Nifong L. The evolution of and early experience with robot assisted mitral valve surgery. Surg Laparosc Endosc Percutan Tech. 2002;12:58–63. [PubMed] [Google Scholar].

DA VINCI

The Surgeon Robot

References

- Gynaecologic Oncology, ELSEVIER, ElSahwi, Hooper, De Leon, Gallo, Ratner, Silasi, Santin, Schwartz, Rutherford, Zodi [Moodle UWSDT] (2011) "Comparison between 155 cases of robotic vs. 150 cases of open surgical staging for endometrial cancer", 27th July. Available at: [25](https://pdf.sciencedirectassets.com/272587/1-s2.0-S0090825811X00173/1-s2.0-S0090825811008080/main.pdf?X-Amz-Security-Token=IQoJb3JpZ2luX2VjEiX%2F%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJIMEYCIQDIUCyrFhwwHY9jMTogzzn1D3GXMamnhjPcdSan732fZAlhAPQMqrGc3QYKhbpkrh8tkalnAa7cfk%2F6Z4Ei6IY92WTCKr0DCP3%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEQAxoMMDU5MDAzNTQ2ODY1lgwPqd tZYFwXneXQlZAqkQMnsOxXqtyy2NVFt2LxNi286tubihCg9rkoCe%2FPTyGQtKOcQo3uBYeSIWKh0PcarfQG7Z9rlg9Jk3iPuoXtX097SxboXYWUndDK6iZLiFqR0eTv dz6jay8wdWHzWztSssD%2BOJnl0y7ly8pDdXVNG3PodukOyspwy%2BoZLEwpW2ul8CD5gSQ5qd0TrX3e9woH9xaSnJzhHNGk9RSXPUm1sTjc%2BlltMJTYsF6kG vG83p1LnhyGr1YUIQNv2retLNvFmyqny%2BGRbppzF3ZARGsZM1Jx5onjDaV9mL8paFiEeN%2BNufHqtUtQKhjEV89ITY7rnMDR85pluVXxkihFTVmFofll1JTTwVuo o6iCAutmf%2BdtuiGy9bMwUVVNukQ9ILTz%2BDS%2BOfULzI0KrSAtetxudJ96KNkGKnucbusYQvGaGkmBGysKxzKkhIU%2B74O0silzyK4al54x%2BqAaQgBpfm IKMB%2FLBZ%2Be1BrgKPRjRVsfmwxR0JtAN4Ik7h71cTWzBSKBNcZZbHD1XenjV1SCyGpErwmyjCX0%2Fz9BTrqARKmiHqFETkPWDw3nd%2Bnt0m%2Bga2TV sv6L5%2BNawyX06bU11x0kjdfO8fLiifhBwLGoHzhPnNz%2BSAFCIxLe5tFe2qKu%2BMHWPqnIV6%2F9dCuOJ%2FTT2WHfuwVn%2B5k6xd3SjJT73BKioyaD7sc5 ZTyHE2OGImPdWUPjOvHPY0RWTISiZitdxFwIAWCphBtbp1BFHzsa3dlmEf%2Bd9YwptEsSn6h9jiWnBjzz9Yx9sXVOJwtNdkg5OqMw%2BTRXdGDGgsXHUhkieM rnujs4pQwh3kJik9rK%2B0fQXCfNpiINa0N9G5Aa9wml09h6pQnYJMGQ%3D%3D&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Date=20201126T043753Z&X-Amz-SignedHeaders=host&X-Amz-Expires=300&X-Amz-Credential=ASIAQ3PHCVTYTA6YIJD7%2F20201126%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Signature=42ebf06b6a314ff459a09ba8fabecba75c67c088da70e7264e9be0df2f113123&hash=501b3ec4c7affc929fab8479405506ef59eb31ace8d6f2cfb81bd2f47c666d15&host=68042c943591013ac2b2430a89b270f6af2c76d8dfd086a07176afe7c76c2c61&pii=S0090825811008080&tid=spdf-747ea765-7346-433e-b713-fe1a94f9dc4c&sid=a1530530913138466e68b7d84e92184daa48gxrbq&type=client. (Accessed at: 20 November 2020).</div><div data-bbox=)

DA VINCI The Surgeon Robot

References

-
- HCA Healthcare UK, “The da Vinci Surgical System Advanced robotic surgery for the most delicate procedures”. Available at: <https://www.hcahealthcare.co.uk/about-hca-uk/technology-at-hca/the-da-vinci-surgical-system>. (Accessed at: 24 November 2020).
 - Healthcare IT News (2017) “Understanding smart hospitals and why most aren't there yet”, 23rd October. Available at: <https://www.healthcareitnews.com/blog/understanding-smart-hospitals-and-why-most-arent-there-yet> (Accessed at: 23 November 2020).
 - Healthline (2018), Laparoscopy. Available at: <https://www.healthline.com/health/laparoscopy> (Accessed: 28 November 2020)
 - HIMSS, Nicholas Skinner, Communications Director, Optimum Healthcare IT; a HIMSS Member.(2020) “Technology’s Vital Role in Healthcare and Society” , 29th March. Available at: <https://www.himss.org/resources/technologys-vital-role-healthcare-and-society#:~:text=Our%20ability%20to%20store%2C%20share,saving%20the%20lives%20of%20others>. (Accessed at: 18 November 2020).
 - IEEE Spectrum (2017) In Flesh-Cutting Task, Autonomous Robot Surgeon Beats Human Surgeons.
Available at: <https://spectrum.ieee.org/the-human-os/biomedical/devices/in-fleshcutting-task-autonomous-robot-surgeon-beats-human-surgeons> (Accessed: 23 November 2020).
 - Intuitive, About Da Vinci Systems Available at : <https://www.davincisurgery.com/da-vinci-systems/about-da-vinci-systems> (Accessed: 01 December 2020).
 - Iranmanesh P, Morel P, Wagner O.J, Pugin I, Hagen M. (2010), ` Set-up and docking of the da Vinci surgical system: prospective analysis of initial experience`, THE INTERNATIONAL JOURNAL OF MEDICAL ROBOTICS AND COMPUTER ASSISTED SURGERY, 6, pp. 57-60. DOI: 10.1002/rcs.288. www.interscience.wiley.com. (accessed 02.11.2020).
 - J. Opfermann;S.Leonard;R.Decker;N.Uebele;C.Bayne;A.Joshi;A.Krieger, IROS (2017) Robot surgeon performs flesh-cutting tasks and pseudo-tumor removal [video].Available at: https://www.youtube.com/watch?v=9ptlm-O39XA&feature=emb_title (Accessed: 20 November 2020).
 - JUAN DAVID HERNÁNDEZ, DOSIS,BELLO,WANG, JBORELLI, DARZI. (2004) “Investigación con el sistema da Vinci® en el Hospital St Mary’s de Londres”, 3rd September. Available at: <http://www.scielo.org.co/pdf/rccci/v20n2/v20n2a4.pdf>. (Accessedat: 20 November 2020)
 - Marescaux J, Leroy J, Rubino F, et al. Transcontinental robot-assisted remote telesurgery: feasibility and potential applications. Ann Surg. 2002;235:487–492. [PMC free article] [PubMed] [Google Scholar]
 - Marshal, P.(2014) `Hands-on robots: From surgery to bomb disassembly`, GCN The Technology that Drives Government IT, p.1. <https://gcn.com/articles/2014/05/29/manipulative-robots.aspx> (accessed 04,12,2020).

DA VINCI The Surgeon Robot

References

-
- MedStar Health, Surgical Services. MedStar Health, Surgical Services. Available at: <https://www.medstarfranklinsquare.org/our-services/surgical-services/treatments/robotic-surgery/how-does-robotic-surgery-differ-from-laparoscopic-surgery/#:~:text=Robotic%20surgery%20is%20similar%20to,a%20camera%20and%20surgical%20instruments.&text=Compared%20to%20traditi,onal%20surgery%2C%20robotic,bleeding%20and%20post%2Doperative%20pain.> (Accessed: 20 November 2020.).
 - NCBI, Harold Thimbleby, (2013) “Technology and the Future of Healthcare”, 1st December. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4147743/>. (Accessed 25 November 2020).
 - NHS, (2010), London Bridge Hospital, Availble at :<https://www.nhs.uk/Services/hospitals/Overview/DefaultView.aspx?id=729> (Accessed 25 November 2020)
 - Palep J.P. (2009). `Robotic assisted minimally invasive surgery`. J Minim Access Surg. 5(1): 1–7. DOI: 10.4103/0972-9941.51313. (accessed 01.11.2020).
 - ProQuest, Cui, Yongzhen; Cheng, Li; Xu, Zhongfa; Wang, Yingming; Sun, Yamei [Scholarly Journal] [Moodle UWSDT], (2017) “Robot-assisted versus conventional laparoscopic operation in anus-preserving rectal cancer: a meta-analysis” 22 September. Available at: <https://search-proquest-com.ezproxy.uwtsd.ac.uk/docview/2229805041/fulltextPDF/B45F6F2F67054591PQ/1?accountid=130472>. (Accessed 20 November 2020.)
 - Richard M (2017) The independent regulator of health and social care in England, Available at :<https://www.cqc.org.uk/location/1-126955902/inspection-summary#overall> (accessed 20 November 2020)
 - Satava RM. Surgical robotics: the early chronicles: a personal historical perspective. Surg Laparosc Endosc Percutan Tech. 2002;12:6–16. [PubMed] [Google Scholar].
 - Shutterstock. Available at : <https://www.shutterstock.com/search/robot+da+vinci> (accessed 04.12.2020).



DA VINCI The Surgeon Robot Q&A