
ICU Management of patient with LVAD
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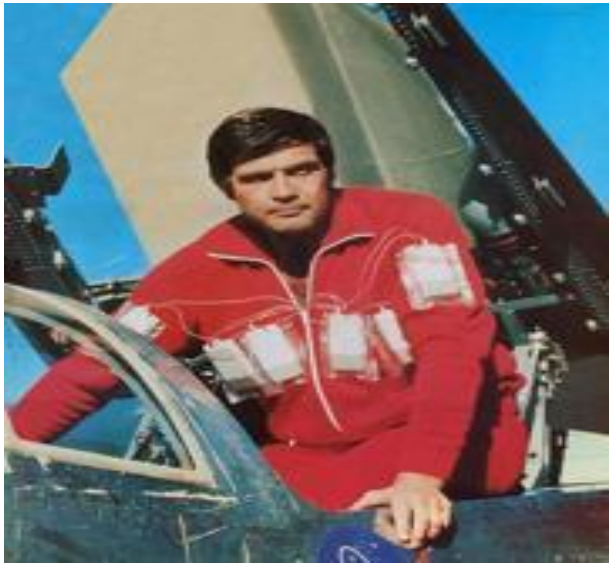
Objectives

- Introduction
- Classification
- Indications
- LVAD technology
- ICU Management

The Six Million Dollar Man



The Six Million Dollar Man

- Replaced by hardware prostheses
- *We can rebuild him*
- *We have the technology*
- *We can make him better than he was befor*

How Should They Rebuild ?

LVAD Technology

Although cardiac transplant remains the gold standard for the treatment of end-stage heart failure, limited donor organ availability have increased the demand for alternative therapies

Classification

- Variety of ways ...
- *Which side..*
- *How we use it ..*
- *Where is the pump located..*
- *What is the mechanism*
- *Generation of the device*

How we use it

- **Bridge to Transplant** When an LVAD is implanted in a patient waiting for a heart transplant .
- The patient's LVAD may remain in place for several years until a heart donor becomes available for transplant.
- **Bridge to Recovery** LVAD that is implanted for temporary heart failure.
- In rare circumstances, a heart may recover its strength after being given time to "rest" with the help of an LVAD.
- **Destination Therapy** If a patient is not eligible for a heart transplant, an LVAD may be implanted as a permanent solution.
- and is becoming more and more common as LVAD technology—and the quality of life it offers—continues to improve.
- **Bridge to Decision**

Which side

- *Basic types of VADs are*
- Left ventricular assist device (LVAD)
- Right ventricular assist device (RVAD).
- If both types are used at the same time, they're called a biventricular assist device (BIVAD)

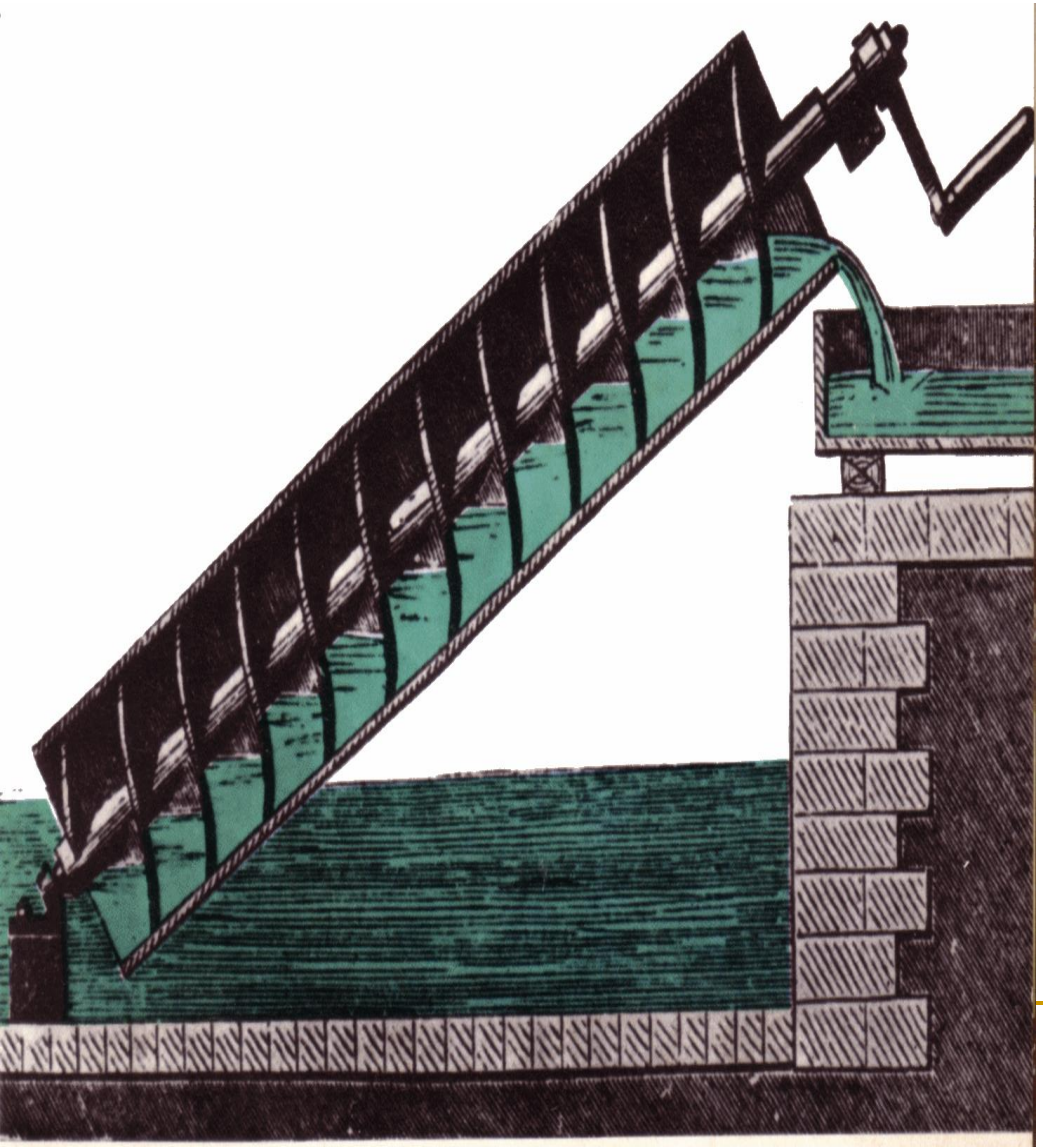
The REMATCH

- The REMATCH (Randomized Evaluation of Mechanical Assistance for the Treatment of Congestive Heart Failure)
- The trial was designed to compare long-term implantation of left ventricular assist devices with optimal medical management for patients with end-stage heart failure who require, but do not qualify to receive cardiac transplantation.
- The trial demonstrated an 81% improvement in two-year survival among patients receiving HeartMate XVE compared to optimal medical management.
- As a result of the clinical outcomes, the device received FDA approval for both indications, in 2001 and 2003, respectively.

First generation VADs

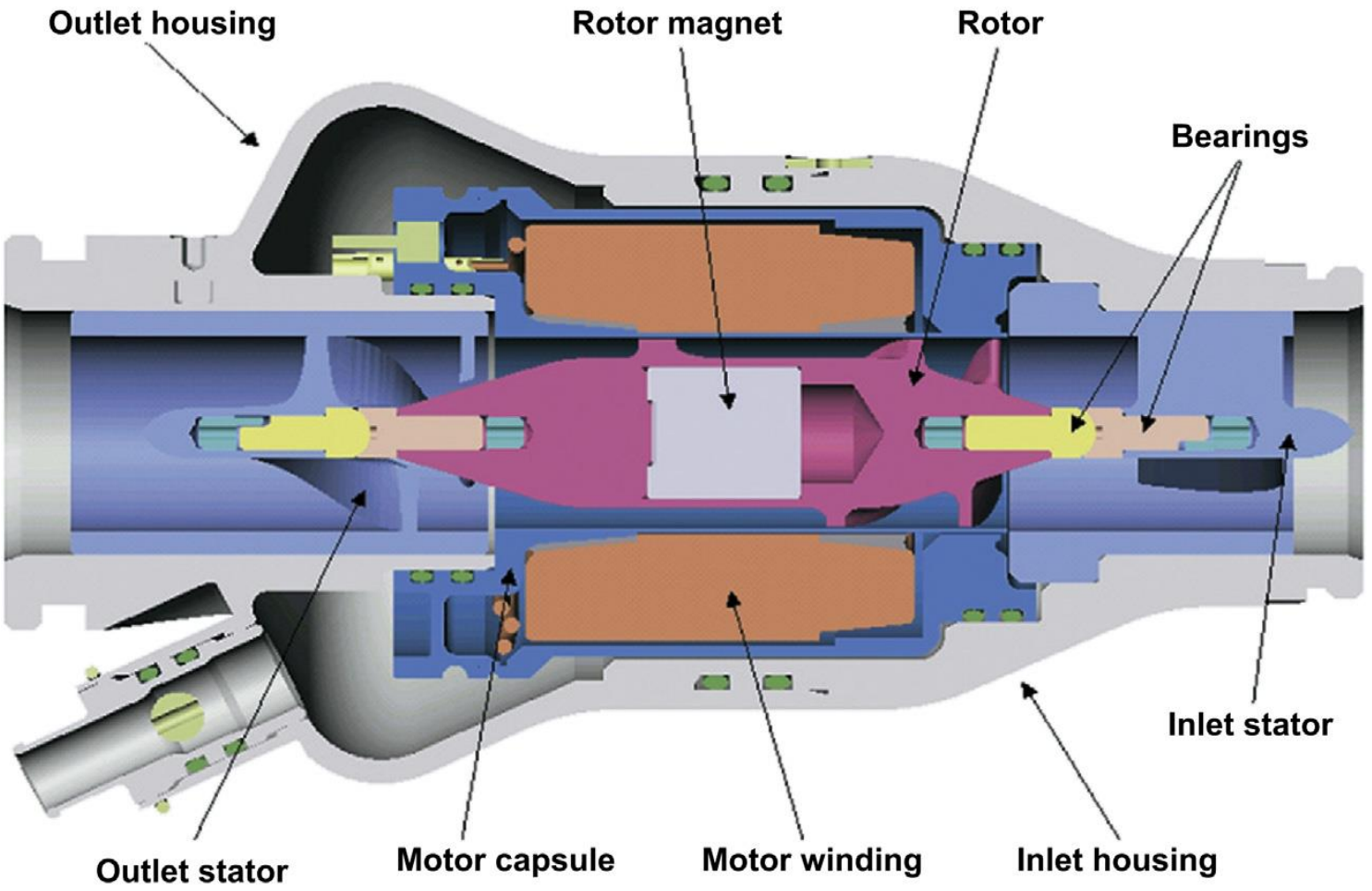
- The early VADs emulated the heart by using a "pulsatile" action , that mimic the natural pulsing action of the heart.
- Where blood is alternately sucked into the pump from the left ventricle then forced out into the aorta.
- Exited first.....
- Noisy .....big.....surgery require extensive dissection,
- Bleeding more.....higher infection

Archimedes Screw



Precision Graphics

Second generation VADs



Second generation VADs

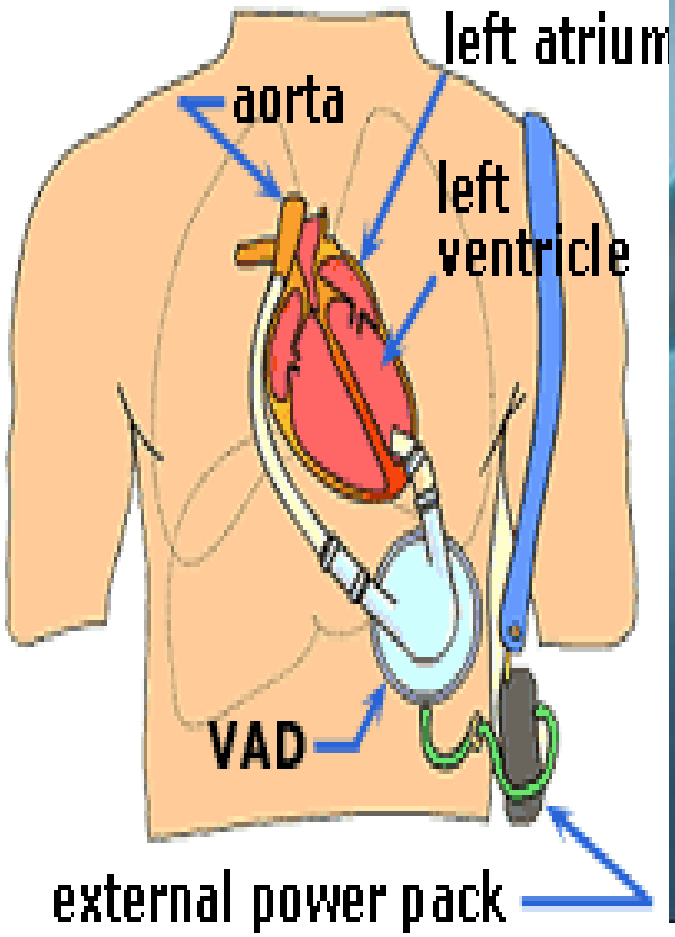
- More recent work has concentrated on continuous flow pumps, which can be roughly categorized as either centrifugal pumps or axial flow driven pumps.
- Advantage....
- Less noisy..... Silent operation
- Greater simplicity
- Smaller size and weight, greater reliability.
- More durable than pulsatile

HeartMate II

components

- Internal and external components.
- Inflow cannula, pump ,outflow graft
- **Driveline** extends from the pump, out through the skin, and connects the pump to a **controller**
- Power sources worn outside the body
- Each device has specific carrying cases to allow to move about freely with the equipment

HeartMate II



LVAD technology continues to improve

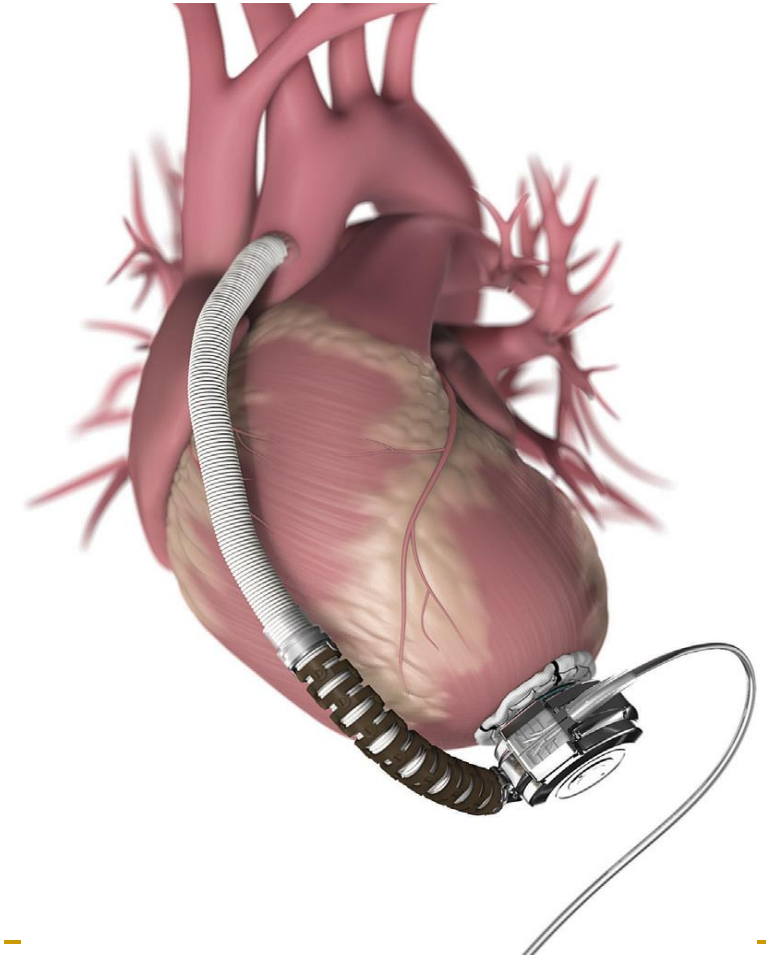
Third generation VADs

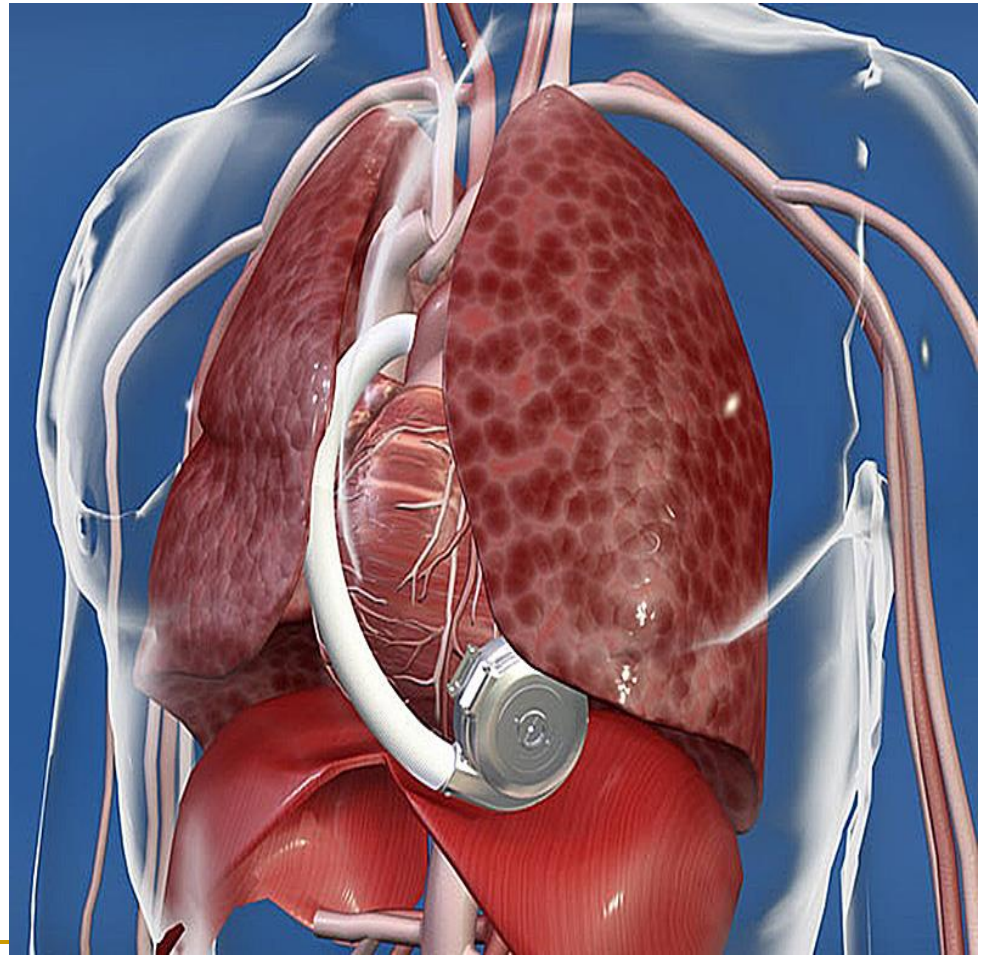
- Third generation VADs suspend the impeller in the pump using either hydrodynamic or electromagnetic suspension, thus removing the need for bearings and reducing the number of moving parts
- Smaller size, Thinner driveline
- Lack of contact bearings
- No mechanical wear-and-tear
- Potential for greater durability than previous-generation device
- Ideal for small patients, including children
- Absence of friction and heat generation

Third generation VADs

- The HeartMate III
- HeartWare

HeartWare LVAD apical (pericardial) location of pump

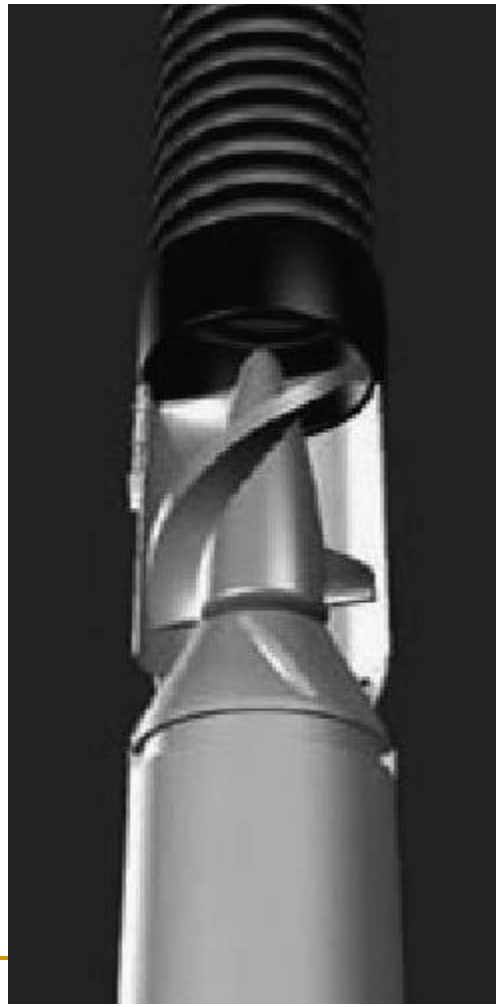




Another technology TET

- Trans cutaneouse energy transfer
- The power transfer from external coil to internal one
- *NO direct electrical connection.....*
- *NOT using percutaneous cables.*
- Apart from the obvious cosmetic advantage this reduces the risk of infection and the consequent need to take preventative action.

PERCUTANEOUS LVAD: IMPELLA



PERCUTANEOUS LVAD: IMPELLA

- The percutaneous placement of the device overcomes a huge limitation of surgically implanted devices.
- The catheter system crosses into the ascending aorta, with the tip of the catheter containing a ‘‘pigtail’’ that crosses aortic valve and rests in the left ventricle .
- Blood pooled in the left ventricle is ‘‘propelled’’ with a motor through the aortic valve and into the arterial system via the aorta.
- The Impella device provides direct CO support, therefore reducing myocardial workload and oxygen consumption

ICU Management of patient have LVAD

System operation

- Should be able to identify and respond appropriately to alarm symbols and audible tones.
- The device must have an adequate power supply at all times, either through the power base unit or battery pack,
- Loss of power will result in the pump stopping, which may have serious consequences especially in those patients who are device-dependent

Right ventricular function and volumes

- Avoid setting the pump speed too high, which can result in ventricular suction and collapse and initiate arrhythmias
- When setting pump speed, the RV should be assessed to see if it becomes dilated and hypocontractile at either high or low speeds.

Anticoagulation and bleeding

- Combination of antiplatelet and anticoagulation agents long-term, mostly relying on warfarin and aspirin
- The INR levels for those patients maintained on warfarin average 1.8-2.3

Blood pressure monitoring and management

- Due to the continuous-flow nature of the LVAD, it is often difficult to find a heart rate and measure blood pressure by the usual physical examination techniques. .
- Pulse pressure ... Very narrow
- *Automatic blood pressure cuffs may not detect a blood pressure*
- *manual blood pressure cuff, the start of Korotkoff sounds is assumed to represent mean blood pressure*.
- *Doppler ultrasound is often preferred to measure blood*
- Arterial line ..... Challenging

- the goal being to maintain a mean pressure of 70 to 80 mmHg with a maximum pressure below 90 mmHg.

Investigation

- CT Scans or X-Rays are OK
- MRI..... NO

Rhythm

- Tolerate VT/VF
- *Can you shock him ????*

If there is cardiac arrest ??

- ACLS protocol
- Give all drugs in ACLS
- ***But,,,,,***

Nursing Management

- Patient NOT to kink, bend or pull the driveline
- Patient NOT to disconnect the driveline from the controller (under normal circumstances)
- Patient NOT to Sleep on his stomach
- Patient NOT to Take a bath
- Patient NOT to attempt to repair LVAD equipment himself
- Aseptic maintenance of the exit site
- Immobilization of the driveline

The use of mechanical circulatory support as long-term therapy in selected patients with advanced heart failure is the standard of care at many medical centers


Thank You!


Questions