Objective 1 - Describe the pattern of sepsis and septic shock in Lister hospital.

What is sepsis?

Sepsis can be defined as a life threatening organ dysfunction due to dysregulated host response to infection.

Recently there has been a change in the definitions of sepsis within the UK. With the abandonment of the old definitions:

- **SIRS - 2 out of 4 (tachycardia >90 Tachypnoea>20 WCC<4->12 temp <36->38)**
- **Sepsis - SIRS + infective cause**
- **Severe sepsis - organ dysfunction**
- **Septic Shock - persistent hypotension**

In favour of only two:

- **Sepsis - Infection suspicion + (2/3 quick SOFA criteria of BP<100 Altered Mental State tachypnoea >22)**

This definition gives a roughly 10% chance of mortality, however this mortality can be more accurately estimated using the full SOFA criteria, which takes into account these 6 systems, as opposed to only the 3 in the quick version:

Brain - GCS

Cardiovascular - Mean Arterial Pressure

Respiratory - Pa02/Fio2

Renal - Creatinine

Liver - Bilirubin

Blood - Platelets

- **Septic shock - Sepsis + despite over 2L of fluid resuscitation - MAP is still < 65**

- or lactate is >2mmol

This definition of septic shock gives a 40% chance of mortality.

This change of definitions occurred due to the wording of 'severe sepsis' insinuated that sepsis alone was not severe, with its 10% mortality begging to differ.

Epidemiology of sepsis

Sepsis, being very relevant to my elective in the ITU, is the most common cause of death in critically ill patients in non-cardaic intensive care units.

Data on sepsis is hard to come by and therefore the disease burden is difficult to estimate, however crude projections show the incidence of sepsis in developed nations to 1 in 1000 people and in 40% of these cases it progresses to severe sepsis.

Treatment of sepsis

The current sepsis protocol once it has been recognised in a patient is currently:

3 out: - Take blood and test for FBC and lactate

- Take a blood culture

- Take urine output

3 in: - Give antibiotics

- Give fluid

- Give 02

And perform a septic screen to find source of infection, with this include several of:

- **Urine dip**
- **CXR**
- **Skin swab, cannula swab**
- **Stool culture**
- **CT and Lumbar puncture**

References:

www.survivesepsis.org

Mayr FB, Yende S, Angus DC; Epidemiology of severe sepsis. Virulence. 2014 Jan 1 5(1):4-11. doi: 10.4161/viru.27372. Epub 2013 Dec 11.

Jawad I, Luksic I, Rafnsson SB; Assessing available information on the burden of sepsis: global estimates of incidence, prevalence and mortality. J Glob Health. 2012 Jun 2(1):010404. doi: 10.7189/jogh.02.010404.

Objective 2 - Describe the pattern of health provision in critical care in the UK

Within the UK we operate a national healthcare service in which this service is completely funded through taxes so that no patient has to pay at the point of care.

Currently the NHS operates a 'payment by results' system to work out how much to pay a hospital for the treatment provided to a patient. This occurs through once a patient has left hospital a diagnostic code and procedure codes are applied to the stay of the patient. These codes are then submitted and a 'health resource group' descriptor is then generated that applies to a nationally set tariff for that patient stay.

It is then taken into account whether the inpatient stay was elective or non-elective and consideration of whether the stay was within the length of time known as the 'trim point'. Days longer than the trim point are charged at a set rate, sometimes referred to as 'hotel costs'.

Finally these costs are then varied due to what is called 'market forces factor' which takes into account the location of the hospital and the possibility of local costs to that hospital being higher than elsewhere. An example of this algorithm for cost calculation is shown in figure 1.

Additionally however some aspects of inpatient care is not included in a 'health resource group' descriptor, one of these aspects is critical care. Critical care costs are based on the number of organ systems being supported at any time during that patient admission. An example of the average costs of ICU care is shown in table 1.

REFERENCE:

http://bmjopen.bmj.com/content/5/4/e005797

Objective 3: Global/Public Health related objective * What is the disease pattern of diabetic ketoacidosis and how is this managed in the UK.

What is Diabetic Ketoacidosis?

Diabetic ketoacidosis occurs in insulin deficients patient usually suffering from type 1 diabetes. The body's sugars levels are not able to be lowered and in addition throughout the rest of the body fatty acids starts to be broken down leading to a massive increase in ketone bodies. These ketone bodies are acidic and when they enter the blood in high amount they overpower the bloods ability to buffer the ph change and acidosis occurs.

Epidemiology of:

- DKA

Within the UK 6% of all cases of DKA are new diagnosis of type 1 diabetes and around 8% of cases are found in type 1 diabetic patients secondary to a different presentation. Other presentations of this condition are primarily due to diabetic ketoacidosis and occur in patients already diagnosed with type 1 diabetes. The estimation of this likelihood of this occuring in a patient with type 1 diabetes is around 4% per year.

- Type 1 diabetes

Type 1 diabetes however is an autoimmune condition that has a strong genetic component coupled with an environmental trigger to cause the onset of the disease. In monozygotic twins the concordance is around 50%.

The incidence of this disease varies throughout the world with the genetic component being more common among Europeans. This is showed through the average incidence in Latin America and East Asia being around 1 new case per 100,000 compared to 30 new cases per 100,000 in Scandinavia.

What is the management of DKA?

The mainstay of treatment is:

- **1. Correct dehydration using 0.9% sodium chloride given intravenously.**
- **2. Administering fixed rate insulin at a rate of 0.1 units of insulin per kg per hour with also continuation of long term insulin therapy.**
- **3. Careful monitering of potassium concentration in blood, and replacement if necessary.**
- **4. Monitering of glood glucose, ph and ketone levels hourly.**

- **5. Once blood glucose level below 14mmol give 10% glucose at a rate of 125ml per hour.**

- **6. Then finally when ketones and ph are within normal range, try to restart on fast acting subcutaneous insulin and allow patient to eat and drink.**

REFERENCES:

http://www.bmj.com/content/351/bmj.h5660.long

rNarayan, K. M. Venkat; Williams, Desmond; Gregg, Edward W.; Cowie, Catherine C. (2010). Diabetes Public Health: From Data to Policy. Oxford University Press. p. 671. ISBN 9780199749140.

https://www.evidence.nhs.uk/formulary/bnf/current/6-endocrine-system/61-drugs-used-in-diabetes/613-diabetic-ketoacidosis

Objective 4: What are the specific clinical and communication skills that you have developed during your time in critical care medicine.

The communication skills necessary for working within critical care medicine are without a doubt are a fundamental skill to work and flourish as an effective doctor, not only in the communication with patients and families about changes in a patients conditions that are commonly sudden and severe but also regularly with the variety of different healthcare professionals.

Throughout my elective, there were many situations that I observed these communication skills seemingly effortlessly being used.

Every morning of my elective I would attend the handover in which there were roughly 25-30 patients requiring verbal as well written, in the form of the patient list, communication of in depth details of all the patients on the ward including presenting complaints, past medical history, current status as well as outstanding jobs required to do by the team. During my time I noticed some common factors among the times in which the handover

was performed well. The most common factor was the structure of how the patient information was communicated. During medical school, we were taught about the use of 'SBAR' framework and its helpfulness, however we have limited opportunity to see its use in practice on a regular basis. However being on the ITU, an area with such a high turnover of patients and regular rotation of consultants, it was extremely important for efficient and effective communication of relevant clinical details nearly every day. And I noticed this SBAR framework being used regularly by the members of the team and it really aiding the communication. I really appreciated seeing this and admired the ability of the staff to consistently perform this action and it made me extremely motivated to one day too be able to handover as competently.

Away from the handover, other areas of communication that I learnt from was the desire and coordination of the team to regularly meet up and update each other of outstanding jobs left to complete on the ward. This allowed everyone to be constantly working on the same page, so everyone knew what jobs had been completed and also to add any new jobs that arose throughout the day, allowing the team to most effectively manage and plan their work. It became very clear how this communication allowed the best coordination of the team. Again this is something I will strive to include in my future work in the hospital.

Also another thing I learned during my elective was uniquely on the intensive therapy ward was the need to not only communicate effectively amongst your own team to keep everyone updated and clear on the plan for patients but also the need to liaise with other teams of doctors from different specialties that were also managing the patient so that you were both using each other's expertise to make the treatment as effective as possible. Again this was either verbal on ward rounds or through writing clear notes on the plan to allow other teams to be informed.

Another important lesson that I learned was the art of persuasion that you have to incorporate into your radiology requests. There was an instance in which an emergency MRI was requested for a young man with a personality change in which a CT scan did not show any immediately obvious abnormality. The MRI list was full for that day and this patient required additional anaesthetic support during the transfer for which a porter had to arrange. I had to first gather all the information about the patient from the ITU notes as well as also from the neurosurgical team, learn of the investigations that had been done to this point and think of too the remaining possibilities on the differential that we were helping to rule out through an MRI. Then I had to sell this request to the radiologist in persuasive way to ensure this happened. I then had to alert the radiographer of when the patient was going to come down, and then arrange with a porter and anaesthetist to be available for this transfer. I learnt the importance of the first step of gathering the information to be key to help aid the understanding of the radiologist and help in the delivery of the request. In this instance I was successful in my request and helped rule out any underlying neurological problem that could be the cause of his symptoms.