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The Effectiveness of Lactated Ringers Solution Verses Normal Saline

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PATIENT CARE ISSUE

Background & Significance

- In this review of literature we aim to determine which crystalloid solution would be the most beneficial and safe for
  - **Aim 1:** Patients experiencing shock due to hemorrhage
  - **Aim 2:** Patients undergoing organ transplant or repair
- The choice of crystalloid solutions, such as Lactated Ringer's solution or Normal Saline is under debate as to which should be used during specific scenarios to achieve safe fluid administration
- The purpose of this literature review to discover whether or not there was evidence to support fluid administration of either Normal Saline or Lactated Ringer's in fluid resuscitation or during surgery.
- Table 1 gives a detailed description of the Normal Saline and Lactated Ringer's solution contents as compared to blood
- Framework of the study: IOWA Model [2]

Table 1: Contents of human serum compared to normal saline and lactated ringers [1]

Parameter	Human Serum	0.9% NaCl	Lactated Ringer's
Na+ mmol/L	135-145	154	131
K+ mmol/L	3.5-5.3	-	5
Ca2+ mmol/L	2.2-2.6	-	2
Cl- mmol/L	95-105	154	111
HCO3- mmol/L	24-32	-	29
Albumin g/L	30-50	-	-
pH	7.35-7.45	5.4	6.0
Osmolality	275-295	308	276

EVIDENCE-BASED PRACTICE QUESTION

Question:

P: In patients requiring intravenous fluids for resuscitation or surgery
I: Does the use of Lactated Ringer's Solution
C: Compared with Normal Saline
O: Provide a better physiologic response to resuscitation or surgery [3]

REGISTERED NURSE INTERVIEW

After interviewing medical staff at Miami Valley Hospital, we concluded that there was no protocol in regards to fluid administration present at this time.

METHODS

Eligibility Criteria

- Credible author
- Within 5 years old
- Knowledge of the topic

Information Sources

- Website searched: NephrologyNow
- Interview: Registered Nurse and Pharmacist
- Databases searched: Medline, PubMed and Cochrane Library

Search Strategy

- Key Words: "crystalloid solutions" "Normal Saline" "Lactated Ringers" "resuscitation" "renal transplantation" and "shock"

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RESULTS

The results of our research included:

- One level 1, four level 2, one level 3 and two level 7 research articles
- Five articles written in the past five years or less
- Three articles written over five years ago
  - These articles were included because of their relativity to the review and high level of evidence

SYNTHESIS OF EVIDENCE

Aim 1 (Shock)

Outcomes

- **pH**

-The findings concluded that Lactated Ringers is the better solution to give to avoid acidosis in patients experiencing shock. [4,5]

- **Oxygenation**

-One study suggests that oxygenation is not affected by either solution during resuscitation in patients experiencing shock. [4]

- **Hemodynamics**

-A hypercoagulable state can result when Lactated Ringers is given to resuscitate patients experiencing shock; this state may prove to be a positive protective symptom but could result in thrombolytic complication leading to readmission to the ED. [4,6]

- **Extravascular Lung water**

- Lactated Ringers proves to result in lower levels of extravascular lung water. [4]

Aim 2 (Organ transplant/repair)

Outcomes

- **pH**

-Normal Saline groups experienced more instances of metabolic acidosis and hyperchloremic acidosis than the Lactated Ringer's group. [7,8,9]

-Lactate, found in LR lowers acidosis due to the strong ion difference (SID) and by the conversion process of lactate into bicarbonate. [9]

- **Urine Output**

- Increased levels of urine output in the NS group compared to the LR group. [7,8]

- **Hemodynamics**

-NS groups required higher platelet transfusion rates than the LR groups, however, the LR group experienced rare but significant cases of hypercoagulatbility resulting in thrombosis. [7,8,9]

- **Hyperkalemia**

-The serum potassium concentration exceeded 6.0 in 19% (5 out of 26) of the NS group members resulting in a hyperkalemic state. [8]

While most of the articles pointed to the solution of choice being Lactated Ringer's over Normal Saline in the outcomes of pH, oxygenation, urine output, hyperkalemia and extravascular lung water the element of hypercoagulability remains as a potential problem with LR. This leaves the choice of solution up the to physician's preference. There can be no protocol determined at this time.

EVIDENCE-BASED PRACTICE RECOMMENDATIONS

Considering the review of literature that we completed there was consensus to conclude that there is limited data on the topic of preferable crystalloid solution to use in patients experiencing shock and organ transplant. It is clear that further research must done in order to develop accurate guidelines for evidence-based practice.

LIMITATIONS

There has not been sufficient research done to conclude with an evidence-based practice recommendation

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