

# Metformin & Gastroenteritis: A Lethal Combination

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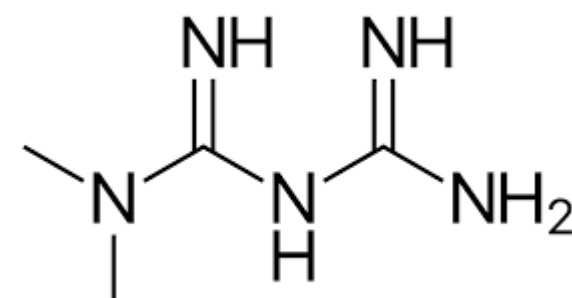
## Introduction

- Metformin is the most common standalone drug prescribed for Type 2 Diabetes Mellitus
- Metformin is excreted in the proximal tubules of the kidney without being metabolized
- Lactic acid accumulation can occur when taking metformin, as it inhibits cellular respiration and hepatic clearance of lactate, and acts as a slightly negative inotrope
- Metformin-associated lactic acidosis (MALA) is a rare but potentially fatal complication of metformin usage

## Presentation

- 60 year-old female was found down at home for unknown duration
- Last seen one day prior when working at church
- Had treatment for a UTI 1 week prior to presentation
- Arrived to ER via EMS alert, responsive, and protecting airway
- (+): nausea, severe vomiting & diarrhea over the past 2-3 days, blurry vision with unclear onset
- (-): Headache, shortness of breath, chest pain, muscle aches, toxic substance ingestion
- PMHx: Type 2 Diabetes on insulin and metformin
- Social Hx: non-smoker, non-drinker, no illicit drug use
- Profoundly hypotensive, hypothermic, hypoglycemic

Figure 1. Metformin's chemical structure lends towards lipophilic properties.



## Initial Work-Up

- Trauma Scans negative for acute fracture
- Serum Osmolality: 338
- Calculated Osmolar Gap: >35
- Volatile Panel, Salicylate, Acetaminophen: undetected
- CK: 290
- TSH: 0.8
- Lactate: 22→23→27
- Anion Gap: 38
- CVC and arterial line placed

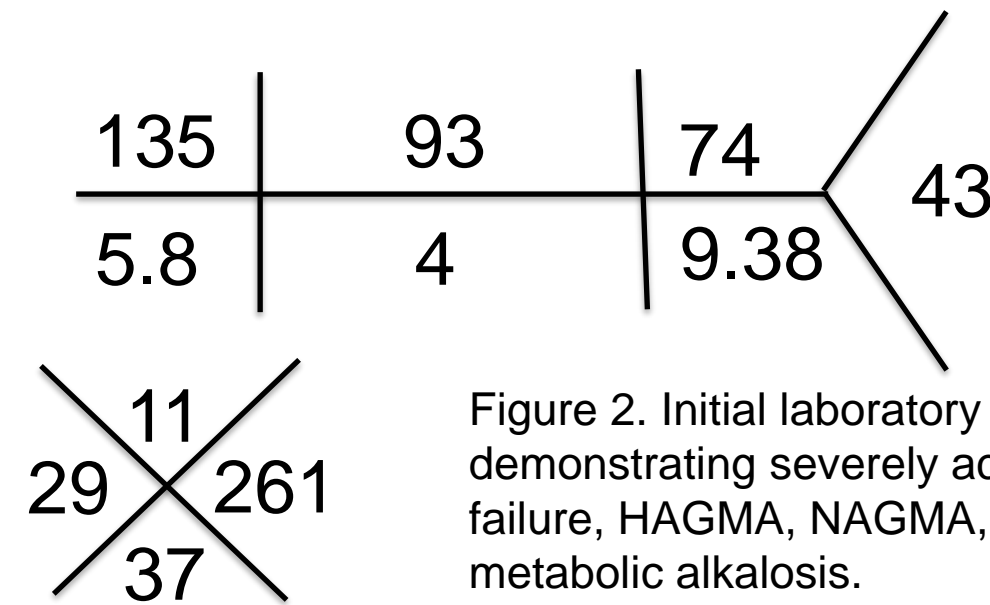


Figure 2. Initial laboratory data demonstrating severely acute renal failure, HAGMA, NAGMA, and metabolic alkalosis.

ARTERIAL	<6.94	▼
pH	<20	▼
pCO2	188	▲
pO2	Unable to perfo...	
HCO3	Unable to perfo...	
TCO2		
sO2	100	
Base Deficit	Unable to perfo...	
Base Excess	Unable to perfo...	

Figure 3. Initial ABG data demonstrating severe Acidosis

## Treatment

- IVF resuscitation with rapidly escalating vasopressor requirements
- Active rewarming and infectious work-up initiated; broad-spectrum antibiotics administered
- NaHCO3 solution and crystalloid initiated given severe NAGMA with rhabdomyolysis
- Toxicology consulted: unlikely toxic-alcohol ingestion
- Nephrology consulted: CRRT initiated
- Bedside echocardiogram: hyperdynamic with normal atrial pressures
- Worsening mentation → proceeded with intubation
- Added Giapreza, stress-dose steroids, and methylene blue
- Unable to augment blood pressure and with rapidly escalating lactic acidosis, decision made to pursue comfort measures

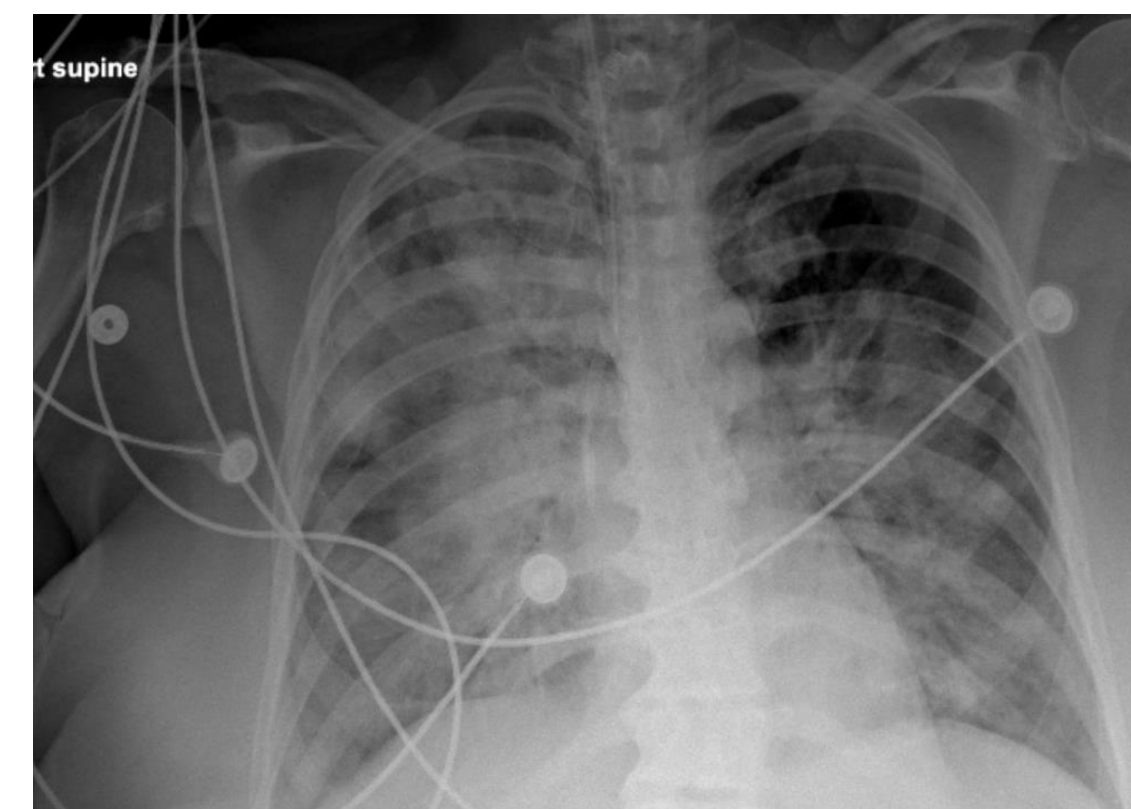


Figure 4. CXR post-intubation revealing bilateral pulmonary infiltrates, not present upon arrival.

## Discussion

- Metformin is not bound by plasma proteins, which can lead to toxic build-up in lipid-rich tissue
- MALA typically presents in the setting of acute renal failure and rapidly rising lactates
- The degree of acidosis is often out-of-proportion to serum Metformin levels
- You are more likely to develop MALA if you have known hepatorenal disease; however, anyone can develop this condition when suffering from an acute decrease in renal perfusion
- Neither lactate, creatinine, or metformin levels predict patient outcome with this condition
- If initiated early enough, hemodialysis can have some success; prognosis is much poorer if derangements other than renal failure and lactic acidosis are present
- Return of renal function is the greatest prognostic indicator in many of these patients

## Conclusion

- Patients on metformin who experience significant gastroenteritis or similar symptoms should be instructed to stop metformin immediately and resume only when directed to do so

## References

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