

Background on HAPE

High altitude pulmonary edema (HAPE) is a type of non-cardiogenic pulmonary edema seen at higher altitudes generally above 2,500m to 3,000m and is usually associated with travel.¹

Pediatric patients present with increased respiratory distress and tend to be afebrile, with temperatures no higher than 38.3C.^{2,3,4}

There is an increased incidence of HAPE with underlying infections causing inflammation including upper respiratory infections, otitis media, and streptococcal pharyngitis.⁵

Objective/Rationale

In our clinic and hospital that is located in Frisco, CO (elevation 2,800m above sea level), we frequently see resident pediatric patients without recent travel presenting with respiratory tract infections and severe hypoxia with symptoms compatible with HAPE.

Many of these children are diagnosed with pneumonia but have rapid and dramatic recovery with just high flow oxygen, without antibiotics. HAPE described in previous publications involve visitors to high altitude. In 1985, Fasules and colleagues published cases of HAPE in high altitude residents with no recent travel as well high altitude residents who developed HAPE after return from a lower elevation.⁶ The diagnoses was made on the basis of cardiac catheterization done in Leadville at 3,080 m.

In our study, we identified three distinct types of HAPE: Classic, Reentry, and Resident.

Methods

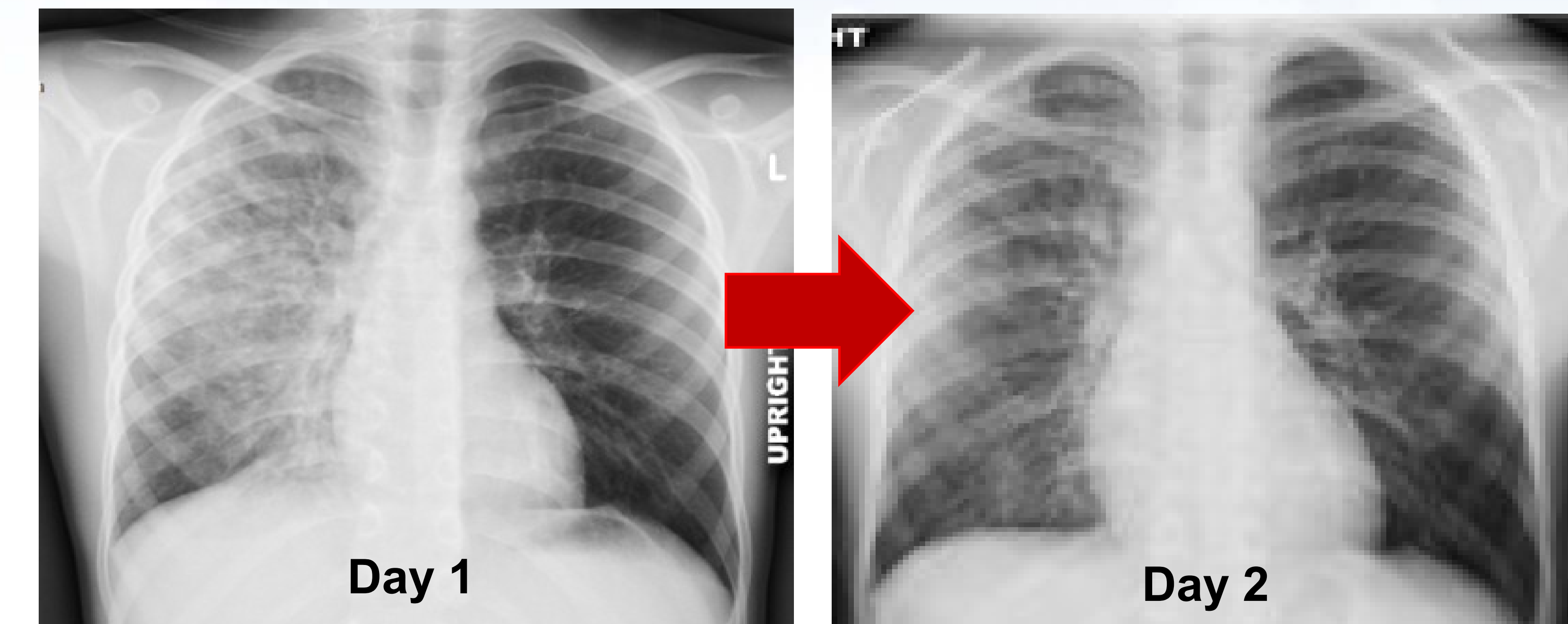
Medical records of 52 patients with suspected HAPE seen in 2015 at Ebert Family Clinic in Frisco, CO were reviewed. Patients studied lived in elevations between 2,440m to 3,500m. Medical records were accessed through the electronic medical record system, EPIC, which was used at both clinic and hospital. Key findings documented for this study were clinical symptoms, vital signs, images including chest x-rays, residency status, and number of days since arrival to higher elevation.

Results

| Age | Gender | Primary | Temp (C) | O2 Sat | Resident | Duration since arrival to high altitude | Prior episode |
|------|--------|---|----------|--------|----------|---|------------------------|
| 14 | M | Fever, URI | 37.7 | 85 | O* | Within past 24 hours | None |
| 5 | M | Fever, cough, vomiting | 37.4 | 86 | O | 4 days | None |
| 6 | F | Fever, cough, otitis media | 37.2 | 86 | O | - | None |
| 6 | M | Fever, cough, rales, otitis media | 37.8 | 86 | O | - | None |
| 2 | M | URI, wheezing, pale, otitis media | 36.6 | 87 | O | - | RSV, Flu (within 1 mo) |
| 5 | M | Fever, cough, sore throat | 38.4 | 88 | O | - | RSV, Flu |
| 8 | M | Fever, cough, sore throat, wheezing | 37.1 | 88 | O | - | None |
| 4 | M | Fever, cough | 38.4 | 87 | O | - | X1 |
| 5 | M | Fever, cough, sore throat, rales | 38.1 | 84 | O | - | None |
| 14 | F | Fever, cough, sore throat | 38.5 | 94 | O | - | None |
| 5 | M | Fever, sore throat, wheezing, rales | 36.7 | 84 | O | - | X1 |
| 4 | M | Fever, cough, vomiting, rales | 38.5 | 84 | O | 6 days | X2 |
| 2 | F | Cough, rales | 37.8 | 85 | O | - | None |
| 5 | M | Fever, cough, otitis media | 38.2 | 88 | O | - | None |
| 6 | M | Fever, cough, wheezing, abdominal pain, otitis media | 38.4 | 85 | O | - | X1 |
| 4 | M | Cough, rales | 37.6 | 86 | O | 24 hours | None |
| 8 | M | Cough, URI, rales | 37.6 | 90 | O | - | None |
| 5 | M | Cough, otitis media | 37.8 | 87 | O | - | None |
| 3 | F | Fever, cough | 36.2 | 84 | O | - | None |
| 4 | M | Cough, rales | 39.6 | 72 | X** | 3 days | None |
| 4 | M | Fever, cough, sore throat, URI, otitis media | 37.5 | 82 | O | - | None |
| 3 | M | Cough, sore throat, URI, wheezing | 37.0 | 84 | O | - | None |
| 5 | M | Cough, URI, wheezing | 37.8 | 87 | O | - | X2 |
| 15 | F | Fever, cough, wheezing | 37.4 | 84 | O | - | None |
| 5 | M | Fever, cough (Flu +), rhonchi | 37.0 | 84 | O | - | None |
| 8 | M | Fever, cough, URI | 36.8 | 85 | O | - | None |
| 6 | M | URI, wheezing | 37.0 | 86 | O | - | X2 |
| 4 | F | Fever, cough, URI, wheezing | 36.7 | 84 | O | - | X1 |
| 22mo | F | Fever, cough, URI | 37.1 | 86 | O | 48 hrs | None |
| 5 | M | Fever, cough | 37.6 | 85 | O | - | None |
| 7 | M | Fever, URI, rhonchi, wheezing, otitis media | 38.4 | 86 | O | - | None |
| 10 | M | Fever, cough, crackles, otitis media | 36.8 | 86 | O | - | None |
| 7 | M | Fever, cough, vomiting, abdominal pain, rales, grunting | 37.2 | 82 | O | - | None |
| 3 | F | Fever, cough, abdominal pain, crackles | 37.0 | 85 | O | - | None |
| 16mo | F | Cough, vomiting, URI, rales | 37.4 | 73 | x | 24 hrs | None |
| 3 | M | URI, rales | 37.4 | 83 | O | - | None |
| 6 | F | Fever, cough abdominal pain | 37.7 | 82 | O | - | None |
| 6 | M | Fever, cough, URI, rales, otitis media | 37.8 | 85 | O | - | None |
| 12 | F | Fever, cough | 37.8 | 85 | O | - | None |
| 20mo | M | Fever, cough, URI, rales | 36.7 | 86 | O | - | None |
| 12mo | F | Fever, cough, URI | 37.4 | 82 | O | 24 hours | None |
| 3 | F | Cough | 37.1 | 82 | O | 2 wks | None |
| 3 | M | Cough, URI | 37.7 | 82 | O | - | None |
| 2 | M | Cough | 37.3 | 89 | O | - | None |

Table of HAPE patients ages 12 months to 15 years of 2015. Clinic draws from five county area above 2500 meters with populations of 5000-29000. Patients seen in 2015: 1637 with 4230 total visits.

*O indicates that the patient is a resident of an high altitude region.
**X indicates that the patient is a visitor to high altitude region.



Example: 10 year old male patient with suspected case of HAPE

Result Summary

| Diagnosis | Outcome (N=52) |
|---------------|----------------|
| Classic HAPE | 2 (4%) |
| Reentry HAPE | 7 (13%) |
| Resident HAPE | 35 (67%) |
| Asthma attack | 2 (4%) |
| Pneumonia | 6 (12%) |

Conclusion

- 3 different categories of high altitude pulmonary edema can be recognized based on the etiology indicated by the patient's residency/travel history; Classic, Reentry, Resident.
- 72% of pediatric patients with clinical features consistent with HAPE were found to have Resident HAPE at our clinic (elevation 2,800m)
- Clinical diagnosis by experienced providers can avoid misdiagnosis, unnecessary antibiotics, and prevent episodes of both resident and reentry HAPE in pediatric patients.

References

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