



Patient Education on Preoperative Anemia:

Promoting patient activation using character-driven animation

TXF Xiang¹, K Pavenski², S Wall^{1,3}

1. Biomedical Communications, University of Toronto; 2. St. Michael's Hospital; 3. Department of Biology, University of Toronto Mississauga

ABSTRACT

- Preoperative anemia affects up to 76% of the surgical population¹.
- Preoperative anemia is a strong predictor of allogenic blood transfusions (ABT), which is associated with worse patient outcomes, including post-operative morbidity and mortality².
- Patient blood management (PBM) programs have been shown to effectively reduce ABT and improve patient outcomes¹.
- Yet, PBM implementation still encounters many barriers. Among others is the lack of patient activation, due to insufficient patient education.
- We developed an educational animation with two goals in mind:
 - 1) **Educate** all preoperative patients on their risk of anemia;
 - 2) **Improve awareness** of the Patient Blood Management (PBM) program, thereby **increasing patient activation** and enhancing preoperative care outcomes.

BACKGROUND

Character-driven Storytelling Promotes Patient Activation

- Patient Activation means to empower patients with the knowledge, skills, and confidence to manage their own condition³.
- The narrative progression of a character-driven story depends on a character's behaviour or their interaction with a narrative element (e.g., "What does she do when diagnosed?").
- Character-driven stories offer several advantages:
 - 1) More effective at signposting access to health resources among different cultural groups⁴.
 - 2) Decreasing patient anxiety⁴ while increasing the trust between patients and their caregiver⁵.

PBM Patient Education Status Quo

- Character-driven stories are largely neglected in patient-ed resources.
- Existing video productions on topics of PBM are lead by clinicians for clinicians, with the aim of covering the basics of transfusion medicine, instead of educating patients.
- Delivery of healthcare messages and engagement rely heavily on text-animations (Fig. 1a) and other motion graphics trends (i.e., whiteboard animation, Fig. 1b), which could exclude non-English speaking patients.



Fig 1: Screen shots of existing PBM videos. a) Text animation from Choosing Wisely: Canada Transfusion Recommendations b) Trauma Transport Checklist, a whiteboard animation.

MATERIALS & METHODS

- 3D assets were modeled and animated in Autodesk Maya 2019. 2D characters were created in Adobe Illustrator. All 2D and 3D assets were composited in Adobe After Effects CC.
- The animation features three character categories: ■ ■ ■

STEPS	CATEGORY I: PATIENTS	STEPS	CATEGORY II: PBM TEAM MEMBERS	STEPS	CATEGORY III: ANTHROPOMORPHIC ACTORS
OUTLINE	• Content experts establish main character profiles • i.e., "East Indian, middle-aged female"	INTERVIEW	Example Questions: • Describe a typical encounter with a patient? • How do you introduce yourself to your patients? • What are some of the most common surgeries?	IDEATE	• Establish that anemia is caused by missing "building blocks" during the production of red blood cells. • Molecular actors include: Iron (ferritin), vitamin B12, folate, hemoglobin
SKETCH					
IDEATE	• Base patient journey off content experts' previous experiences. • E.g.: "Mr. McNeil will receive a hip replacement. Mr. M is anemic due to his undiagnosed rheumatoid arthritis. Mr. McNeil's Hb is normal (106g/L), but his ferritin is falsely high."	IDEATE	• Establish a "PBM flowchart" 	MODEL	 Retrieve target molecule from PDB. E.g.: Hemoglobin Import the molecule to Cinema4D via epmv
ANIMATE	 2D character 3D models with dynamics A 3D+2D sample composite, SS5SH1: "Although anemia can seriously affect your surgery and recovery, it is usually quite treatable."	ANIMATE	 Rigging example of the "PBM nurse" character using DUIK. Red pins indicate the location of each movable joint. Green symbols indicate the position of the joint controllers. The character's pose changes by varying the controller positions.	ANIMATE	Render the imported molecule in Cinema4D: 1) De-oxy Hemoglobin* 2) Oxy-Hemoglobin Animate character behavior using Adobe After Effects CC

Chart 1. Steps to Character Development Based on Character Categories. *: Conformation change animations are restricted to proteins only. Data for conformation changes are retrieved from PDB

RESULT

- The animation follows a typical pre-operative patient's journey from pre-op prep, to diagnosis, and finally to the treatment of anemia.

	SCENE	THEME	COMMUNICATION TARGETS	CHARACTER
17s	1	Introduction	• Pre-operative care • Patient demographics	■ □ □
30s	2	What is anemia	• Causes of anemia	■ □ □
30s	3	Diagnosing anemia	• Measuring Hemoglobin • Symptoms of anemia	■ ■ □
40s	4	Potential outcomes of preoperative anemia	• Transfusion risks • The need of prioritizing treatment	■ ■ ■
75s	5	Treating anemia with the PBM team	• Treatment timing • Meeting your PBM team • Personalized treatment	■ ■ ■
25s	6	PBM Summary	• Avoiding unnecessary tests, transfusions, and bleeding during surgery	■ ■ □
3M 37S TOTAL				

DISCUSSION

- Upon completion, this project will be the first character-driven educational animation addressing PBM.
- We plan to conduct a summative evaluation on the animation once production is complete. The evaluation will focus on the following areas:
 - 1) Quantitative measurement on the patients' knowledge improvement on pre-operative anemia.
 - 2) Likert scale feedback on patient activation. E.g., "I want to speak to my physician about my anemia status after watching this animation. 1: Strongly disagree. 5: Strongly agree."

REFERENCES

1. Meybohm, P., D. Fischer, A. Schnitzbauer, A. Zierer, T. Schmitz-Rixen, G. Bartsch, C. Geisen, and K. Zacharowski. "Patient blood management: Current state of the literature." *Der Chirurg: Zeitschrift für alle Gebiete der Operativen Medizin* 87, no. 1 (January 2016): 40–46. <https://doi.org/10.1007/s00104-015-3011-3>.
2. Shander, Aryeh, and Lawrence Tim Goodnough. "Can Blood Transfusion Be Not Only Ineffective, But Also Injurious?" *The Annals of Thoracic Surgery* 97, no. 1 (January 1, 2014): 11–14. <https://doi.org/10.1016/j.athoracsurg.2013.08.007>.
3. Hibbard, Judith H, Jean Stockard, Eldon R Mahoney, and Martin Tusler. "Development of the Patient Activation Measure (PAM): Conceptualizing and Measuring Activation in Patients and Consumers." *Health Services Research* 39, no. 4 Pt 1 (August 2004): 1005–26. <https://doi.org/10.1111/j.1475-6773.2004.00269.x>.
4. Haigh, Carol, and Pip Hardy. "Tell Me a Story — a Conceptual Exploration of Storytelling in Healthcare Education." *Nurse Education Today* 31, no. 4 (May 2011): 408–11. <https://doi.org/10.1016/j.nedt.2010.08.001>.
5. McWilliam, C.L., Stewart, M., Brown, J.B., McNeil, S., Desai, K., Patterson, M.L., Del Maestro, N., Pittman, B.J., 1997. Creating empowering meaning: an interactive process of promoting health with chronically ill older Canadians. *Health Promotion International* vol. 12 (No. 2), 111–124.