

Supplemental Files

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Bright STAR Respiratory Culture Practices Survey

The purpose of this survey is to assess practices and perceptions about **respiratory secretion cultures from mechanically ventilated patients**. Some people refer to these cultures as **endotracheal aspirate, tracheal** or **sputum cultures**. For simplicity, we refer to these cultures as “**respiratory cultures**” below.

Section 1:

1. Which position best describes your current role in the ICU?

Registered Nurse	Nurse Practitioner
Respiratory Therapist	Physician Assistant
Hospitalist	Fellow Physician
Attending Physician	Other (Please specify)

2. How many years of experience do you have working in a pediatric ICU? (Attending Physicians – Include your fellowship years)

0-5 years	6-10 years
11-20 years	>20 years

Section 2: Respiratory Culture Practices:

3. How often are the following **methods** used to collect secretions for respiratory cultures from patients with **endotracheal tubes** in your unit (Rarely/Never, Sometimes, Often, I don't know):
 - a. Inline endotracheal aspirate
 - b. Open suctioning
 - c. Nasopharyngeal aspirate
 - d. Bronchial brushing or “mini” bronchoalveolar lavage
 - e. Bronchoalveolar lavage

4. How often are the following **methods** used to collect secretions for respiratory cultures from patients with **tracheostomies** in your unit (Rarely/Never, Sometimes, Often, I don't know):
 - a. Inline endotracheal aspirate
 - b. Open suctioning
 - c. Nasopharyngeal aspirate
 - d. Bronchial brushing or “mini” bronchoalveolar lavage
 - e. Bronchoalveolar lavage

5. Who typically **collects** the respiratory secretion samples to send for culture in your unit? (Select all that apply)
 - a. Nurse
 - b. Respiratory Therapist
 - c. Advanced Practice Provider (NP or PA)
 - d. Attending Physician
 - e. Other role (Specify)
 - f. I don't know

6. How often is **saline lavage** used with endotracheal aspiration to obtain a sample to send for culture (i.e. instillation of saline into the airway, then suctioning out the saline to send for culture)?
 - a. Rarely or never
 - b. Sometimes

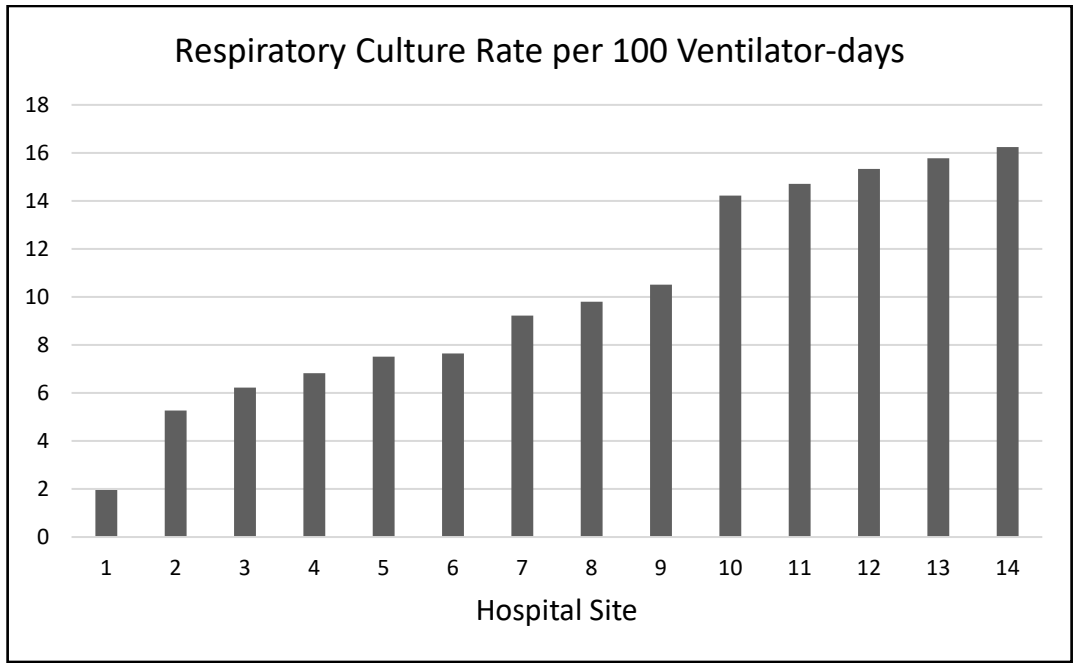
- c. Often
 - d. I don't know
7. If your unit does use saline lavage or saline instillation during sample collection, is there a suggested **volume of saline** that is used?
- a. No, there is not a recommended volume of saline to use
 - b. Yes, there is a recommended volume of saline to use (specify volume in mL below)
 - c. I don't know or not applicable
8. In general, how often is the decision to order a respiratory culture made by the following (Rarely/Never, Sometimes, Often):
- a. Respiratory Therapist
 - b. Nurse
 - c. Advanced Practice Provider (NP, PA)
 - d. Resident Physician
 - e. Fellow Physician
 - f. Attending Physician
9. In general in your unit, how likely would a respiratory culture be ordered for a ventilated patient in the following scenarios? *Assume the patient has not had a recent respiratory culture* (Answer Options: Very Unlikely, Unlikely, Neutral, Likely, Very Likely)
- a. New fever *without other symptoms*
 - b. Persistent fever *without other symptoms*
 - c. New hypotension *without respiratory symptoms*
 - d. Increased volume of secretions *without other symptoms*
 - e. Change in color or thickness of secretions *without other symptoms*
 - f. Increased ventilator support *without other symptoms*
 - g. New opacity on chest imaging *without other symptoms*
 - h. New laboratory change that can be seen with infections (e.g. elevation in WBC or CRP) *without other symptoms*
 - i. New fever AND laboratory changes (e.g. elevation in WBC or CRP) *without respiratory symptoms*
 - j. New fever AND increased secretions *without increase in ventilator support*
 - k. New fever AND increased ventilator/oxygen support
 - l. Request from consulting service (e.g. Oncology, Surgery, Infectious Diseases)
 - m. Request from parent/caregiver
 - n. Surveillance culture in asymptomatic patient
 - o. Respiratory culture obtained concurrent with blood and urine culture (i.e., "pan culture")
10. Which clinical change do you think is **the most common reason** respiratory cultures are ordered from mechanically ventilated patients in your unit?
- a. Increased ventilator/oxygen requirement
 - b. Inability to wean ventilator/oxygen support
 - c. Change in description of secretions
 - d. New fever
 - e. Persistent/recurrent fevers
 - f. Laboratory changes (e.g. increased WBC or CRP)
 - g. Findings on chest X-ray

Section 3: Perceptions, Barriers and Implementation:

11. To what extent do you agree or disagree with the following statements about respiratory cultures *in general*? (Answer Options: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree)
- I feel **confident about indications** to obtain a respiratory culture
 - All ventilated PICU patients with **new fever** should get a respiratory culture
 - All ventilated PICU patients with **increased secretions** should get a respiratory culture
 - Respiratory cultures are likely to grow bacteria from patients with **tracheostomies**
 - Respiratory cultures are likely to grow bacteria from patients with **endotracheal tubes**
 - The information from respiratory cultures is **useful to guide antibiotic therapy**
 - Medication changes** can influence secretion characteristics (e.g. diuretics, sedatives)
 - It is **easy to obtain a secretion specimen** to send for respiratory culture
 - I would find a decision support algorithm **helpful** to guide when to obtain a respiratory culture
 - I expect **I would follow** a decision support algorithm guiding when to obtain respiratory cultures
12. To what extent do you agree or disagree with the following statements about respiratory cultures practices *in your unit*? (Answer Options: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree)
- Respiratory cultures are ordered **too frequently** in our unit
 - The **attending physician** is typically included in the decision-making process to order a respiratory culture
 - Nurses** are typically included in the decision-making process to order a respiratory culture
 - Respiratory therapists** are typically included in the decision-making process to order a respiratory culture
 - Clinicians always conduct a **physical exam** before they order a new respiratory culture
 - Clinicians always review patients' **microbiology history** to see if they have had a recent respiratory culture before ordering a new one
 - Clinicians always review **vital signs and other clinical data** (e.g. labs, X-rays) before ordering a respiratory culture
 - Consulting services** play an important role in the decision to order a respiratory culture (e.g. Oncologist, Infectious Diseases, Surgery Services)
 - Clinicians have a **low threshold** to order respiratory cultures in response to clinical changes such as fever
 - Respiratory culture ordering practices **vary among clinicians**
 - Respiratory culture ordering practices **vary among patient populations** (i.e. oncology patients, patient with tracheostomies)
 - A decision support algorithm guiding when to obtain respiratory cultures would **help align the ICU team and/or consulting teams** regarding need for respiratory cultures from ventilated patients
13. To what extent do you agree with the following factors that **could be a barrier** to changing respiratory culture practices in your unit? (Answer Options: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree)
- Practices vary widely** between clinicians, so it will be difficult to standardize

- b. Some clinicians may be **reluctant to change** their practices
 - c. There is **insufficient evidence** that respiratory cultures can be reduced safely
 - d. Clinicians may not change practices due to **concern for missing a diagnosis** of ventilator-associated pneumonia or tracheitis
 - e. It is difficult to review **pertinent clinical information from the electronic medical record** before ordering a respiratory culture (due to time constraints)
 - f. It is difficult to perform **physical exams** prior to ordering a respiratory culture (due to time constraints)
 - g. **High patient care workload** may make it difficult to change respiratory culture practices
 - h. It is difficult to change respiratory culture practices for **medically complex patients**
 - i. Opinion of **consulting services** may differ
 - j. Opinion of **patient/caregiver** may differ
14. Please describe any other potential barriers to changing respiratory culture practices in your unit.
15. Which methods for improving respiratory culture practices do you think would be **most effective** in your unit (Select all that apply):
- a. Decision support algorithm or guideline
 - b. Written educational materials
 - c. Didactic presentation or lecture
 - d. Brief educational video
 - e. Criteria enforced by laboratory (e.g. repeated samples not processed within 3 days)
 - f. Guidance built into EMR order
 - g. Feedback about unit performance
 - h. Feedback about individual performance
 - i. Involving parents/caregivers as advocates
 - j. Other (Enter response if other ideas)

Supplemental Figure 2. Respiratory culture rates



Supplemental Figure 2 footnotes:

Respiratory culture rates were calculated as an average of the 2019 and 2020 monthly respiratory culture rates per 100 ventilator-days. Culture types included endotracheal cultures, tracheal cultures, bronchial brush and sputum cultures. Culture types excluded bronchoalveolar lavage cultures, nasopharyngeal and tissue cultures.

Supplemental Table 1. Proportion of survey responses in agreement across sites for all questions.					
Abbreviated question	Median response	IQR		Minimum	Maximum
For endotracheal tube, often collect via open suctioning	0.23	0.14	0.45	0.02	0.80
For endotracheal tube, often collect via inline endotracheal aspirate	0.82	0.57	0.89	0.14	0.95
For endotracheal tube, often collect via nasopharyngeal aspirate	0.08	0.06	0.17	0.04	0.27
For endotracheal tube, often collect via bronchial brushing or "mini" BAL	0.04	0.00	0.07	0.00	0.77
For endotracheal tube, often collect via BAL	0.05	0.00	0.15	0.00	0.27
For tracheostomy, often collect via inline endotracheal aspirate	0.71	0.44	0.81	0.31	0.90
For tracheostomy, often collect via open suctioning	0.40	0.25	0.50	0.02	0.80
For tracheostomy, often collect via nasopharyngeal aspirate	0.05	0.00	0.12	0.00	0.27
For tracheostomy, often collect via bronchial brushing or "mini" BAL	0.00	0.00	0.04	0.00	0.49
For tracheostomy, often collect via BAL	0.05	0.00	0.08	0.00	0.17
Saline lavage is often used to obtain sample	0.39	0.29	0.48	0.12	0.65
Saline lavage is sometimes used to obtain sample	0.41	0.38	0.56	0.32	0.74
There is a suggested volume of saline that is used	0.04	0.00	0.08	0.00	0.33
Samples are typically collected by APPs	0.00	0.00	0.02	0.00	0.04
Samples are typically collected by RT	0.99	0.89	1.00	0.55	1.00
Samples are typically collected by Nurses	0.51	0.23	0.77	0.05	1.00
Samples are typically collected by Physicians	0.01	0.00	0.05	0.00	0.18
Samples are typically collected by Other Role	0.06	0.01	0.09	0.00	0.19
Decision to order culture is often made by the Attending	0.86	0.72	0.91	0.68	0.95
Decision to order culture is often made by the Fellow	0.82	0.59	0.91	0.32	1.00
Decision to order culture is often made by the APP	0.69	0.60	0.77	0.41	0.90
Decision to order culture is often made by the Resident	0.43	0.35	0.58	0.21	0.78
Decision to order culture is often made by the Nurse	0.05	0.00	0.09	0.00	0.18
Decision to order culture is often made by the RT	0.05	0.01	0.10	0.00	0.12
Findings on chest X-ray	0.01	0.00	0.04	0.00	0.18
New fever	0.30	0.21	0.42	0.06	0.62
Laboratory changes (e.g. increased WBC or CRP)	0.03	0.02	0.05	0.00	0.07
Persistent/recurrent fevers	0.14	0.08	0.21	0.00	0.24
Change in description of secretions	0.33	0.27	0.43	0.16	0.50
Increased ventilator/oxygen requirement	0.13	0.06	0.21	0.00	0.33

Inability to wean ventilator/oxygen support	0.00	0.00	0.00	0.00	0.05
New fever without other symptoms	0.48	0.38	0.59	0.20	0.86
Persistent fever without other symptoms	0.72	0.64	0.81	0.50	0.91
New hypotension without respiratory symptoms	0.23	0.17	0.30	0.05	0.50
Increased volume of secretions without other symptom	0.53	0.40	0.62	0.33	0.82
Change in color or thickness of secretions without other symptoms	0.67	0.54	0.78	0.33	0.85
Increased ventilator support without other symptoms	0.34	0.29	0.44	0.19	0.68
New opacity on chest imaging without other symptoms	0.43	0.39	0.54	0.23	0.69
New laboratory change that can be seen with infections (e.g. elevation in WBC or CRP) without other symptoms	0.49	0.38	0.57	0.28	0.95
New fever AND laboratory changes (e.g. elevation in WBC or CRP) without respiratory symptoms	0.67	0.54	0.79	0.44	0.91
New fever AND increased secretions without increase in ventilator support	0.85	0.81	0.94	0.69	0.95
New fever AND increased ventilator/oxygen support	0.90	0.85	0.95	0.81	1.00
Request from consulting service (e.g. Oncology, Surgery, Infectious Diseases)	0.76	0.72	0.84	0.64	0.94
Request from parent/caregiver	0.18	0.13	0.27	0.07	0.36
Surveillance culture in asymptomatic patient	0.06	0.04	0.08	0.00	0.15
Respiratory culture obtained concurrent with blood and urine culture (i.e., "pan culture")	0.76	0.70	0.86	0.52	0.93
I feel confident about indications to obtain a respiratory culture	0.69	0.56	0.74	0.38	0.82
All ventilated PICU patients with new fever should get a respiratory culture	0.27	0.17	0.41	0.05	0.64
All ventilated PICU patients with increased secretions should get a respiratory culture	0.28	0.19	0.41	0.12	0.59
Respiratory cultures are likely to grow bacteria from patients with tracheostomies	0.85	0.79	0.90	0.68	0.95
Respiratory cultures are likely to grow bacteria from patients with endotracheal tubes	0.42	0.34	0.54	0.23	0.61
The information from respiratory cultures is useful to guide antibiotic therapy	0.80	0.69	0.89	0.62	0.97
Medication changes can influence secretion characteristics	0.84	0.80	0.87	0.67	0.91
It is easy to obtain a secretion specimen	0.71	0.67	0.84	0.61	1.00
I would find a decision support algorithm helpful	0.79	0.71	0.83	0.64	0.93
I expect I would follow a decision support algorithm	0.82	0.77	0.89	0.72	0.94
Respiratory cultures are ordered too frequently in our unit	0.30	0.25	0.45	0.00	0.54

The attending physician is typically included in the decision-making process	0.73	0.59	0.88	0.20	1.00
Nurses are typically included in the decision-making process	0.40	0.24	0.55	0.17	0.70
Respiratory therapists are typically included in the decision-making process	0.48	0.33	0.57	0.26	0.81
Clinicians always conduct a physical exam	0.24	0.17	0.29	0.14	0.43
Clinicians always review patients' microbiology history	0.49	0.43	0.55	0.38	0.69
Clinicians always review vital signs and other clinical data (e.g. labs, X-rays)	0.58	0.56	0.69	0.38	0.80
Consulting services play an important role in the decision to order a respiratory culture	0.39	0.29	0.51	0.21	0.56
Clinicians have a low threshold to order respiratory cultures	0.57	0.45	0.71	0.19	0.90
Respiratory culture ordering practices vary among clinicians	0.84	0.79	0.89	0.61	1.00
Respiratory culture ordering practices vary among patient populations	0.76	0.69	0.81	0.59	1.00
A decision support algorithm guiding when to obtain respiratory cultures would help align the ICU team and/or consulting teams	0.82	0.79	0.88	0.70	0.93
Opinion of patient/caregiver may differ	0.42	0.38	0.57	0.30	0.69
It is difficult to change respiratory culture practices for medically complex patients	0.40	0.32	0.50	0.19	0.60
Opinion of consulting services may differ	0.64	0.61	0.68	0.41	0.76
Clinicians may not change practices due to concern for missing a diagnosis of ventilator-associated pneumonia or tracheitis	0.62	0.50	0.70	0.31	0.77
There is insufficient evidence that respiratory cultures can be reduced safely	0.17	0.11	0.24	0.03	0.50
It is difficult to perform physical exams prior to ordering a respiratory culture	0.09	0.05	0.11	0.02	0.14
Practices vary widely between clinicians, so it will be difficult to standardize	0.47	0.41	0.57	0.31	0.82
Some clinicians may be reluctant to change their practices	0.70	0.58	0.78	0.41	0.91
It is difficult to review pertinent clinical information from the electronic medical record	0.12	0.09	0.21	0.06	0.36
High patient care workload may make it difficult	0.32	0.24	0.41	0.06	0.59

Supplemental Table 2. Correlation analysis between survey responses (proportion that agree) and site's respiratory culture rates per 1000 ICU patient-days		
Abbreviated question	Correlation coefficient r	P value
New fever without other symptoms	0.71	0.004
Persistent fever without other symptoms	0.77	0.001
New hypotension without respiratory symptoms	0.61	0.02
Increased volume of secretions without other symptom	0.36	0.20
Change in color or thickness of secretions without other symptoms	0.35	0.22
Increased ventilator support without other symptoms	0.24	0.42
New opacity on chest imaging without other symptoms	0.04	0.88
New laboratory change that can be seen with infections (e.g. elevation in WBC or CRP) without other symptoms	0.21	0.46
New fever AND laboratory changes (e.g. elevation in WBC or CRP) without respiratory symptoms	0.63	0.02
New fever AND increased secretions without increase in ventilator support	0.72	0.003
New fever AND increased ventilator/oxygen support	0.14	0.636
Request from consulting service (e.g. Oncology, Surgery, Infectious Diseases)	0.29	0.32
Request from parent/caregiver	-0.01	0.97
Surveillance culture in asymptomatic patient	0.19	0.51
Respiratory culture obtained concurrent with blood and urine culture (i.e., "pan culture")	0.62	0.03
Top reason: Findings on chest X-ray	-0.20	0.50
Top reason: New fever	0.46	0.10
Top reason: Laboratory changes (e.g. increased WBC or CRP)	0.14	0.64
Top reason: Persistent/recurrent fevers	0.38	0.18
Top reason: Change in description of secretions	-0.10	0.75
Top reason: Increased ventilator/oxygen requirement	-0.19	0.52
Top reason: Inability to wean ventilator/oxygen support	0.20	0.49
I feel confident about indications to obtain a respiratory culture	0.38	0.18
All ventilated PICU patients with new fever should get a respiratory culture	0.34	0.23
All ventilated PICU patients with increased secretions should get a respiratory culture	0.41	0.14
Respiratory cultures are likely to grow bacteria from patients with tracheostomies	-0.23	0.43
Respiratory cultures are likely to grow bacteria from patients with endotracheal tubes	-0.09	0.77

The information from respiratory cultures is useful to guide antibiotic therapy	0.44	0.11
Medication changes can influence secretion characteristics	-0.17	0.57
It is easy to obtain a secretion specimen	0.33	0.26
I would find a decision support algorithm helpful	-0.66	0.01
I expect I would follow a decision support algorithm	0.02	0.95
Respiratory cultures are ordered too frequently in our unit	0.41	0.16
The attending physician is typically included in the decision-making process	0.17	0.55
Nurses are typically included in the decision-making process	-0.06	0.84
Respiratory therapists are typically included in the decision-making process	0.00	0.99
Clinicians always conduct a physical exam	0.01	0.97
Clinicians always review patients' microbiology history	0.53	0.05
Clinicians always review vital signs and other clinical data (e.g. labs, X-rays)	0.09	0.76
Consulting services play an important role in the decision to order a respiratory culture	0.00	0.99
Clinicians have a low threshold to order respiratory cultures	0.50	0.07
Respiratory culture ordering practices vary among clinicians	-0.37	0.20
Respiratory culture ordering practices vary among patient populations	-0.16	0.59
A decision support algorithm guiding when to obtain respiratory cultures would help align the ICU team and/or consulting teams	-0.57	0.04
Opinion of patient/caregiver may differ	-0.05	0.86
It is difficult to change respiratory culture practices for medically complex patients	0.27	0.35
Opinion of consulting services may differ	0.06	0.84
Clinicians may not change practices due to concern for missing a diagnosis of ventilator-associated pneumonia or tracheitis	0.19	0.51
There is insufficient evidence that respiratory cultures can be reduced safely	0.03	0.94
It is difficult to perform physical exams prior to ordering a respiratory culture	-0.12	0.69
Practices vary widely between clinicians, so it will be difficult to standardize	-0.15	0.62
Some clinicians may be reluctant to change their practices	-0.21	0.47
It is difficult to review pertinent clinical information from the electronic medical record	-0.39	0.17
High patient care workload may make it difficult	0.07	0.82

Supplemental Table 3. Comparison of Clinicians Responses to Survey Questions to Nurses and Respiratory Therapists				
Abbreviated question	Odds Ratio	95% Confidence Interval		P-value
For endotracheal tube, often collect via inline endotracheal aspirate	0.45	0.32	0.63	<0.001
For endotracheal tube, often collect via open suctioning	1.45	0.8	2.61	0.22
For endotracheal tube, often collect via nasopharyngeal aspirate	0.31	0.12	0.81	0.02
For endotracheal tube, often collect via bronchial brushing or "mini" BAL	1.23	0.43	3.52	0.70
For endotracheal tube, often collect via BAL	0.45	0.28	0.7	<0.001
For tracheostomy, often collect via inline endotracheal aspirate	0.41	0.26	0.64	<0.001
For tracheostomy, often collect via open suctioning	1.69	0.97	2.95	0.06
For tracheostomy, often collect via nasopharyngeal aspirate	0.46	0.16	1.34	0.16
For tracheostomy, often collect via bronchial brushing or "mini" BAL	3.08	1.23	7.75	0.02
For tracheostomy, often collect via BAL	0.43	0.24	0.76	0.004
Samples are typically collected by Nurses	0.96	0.7	1.31	0.79
Samples are typically collected by RT	1	0.52	1.93	1.00
Samples are typically collected by APPs	0.97	0.26	3.6	0.96
Samples are typically collected by Physicians	0.83	0.46	1.51	0.55
Samples are typically collected by Other Role	1.37	0.73	2.55	0.33
Saline lavage is often used to obtain sample	1.23	0.68	2.22	0.49
Saline lavage is sometimes used to obtain sample	0.98	0.6	1.59	0.93
There is a suggested volume of saline that is used	1.1	0.22	5.61	0.90
Decision to order culture is often made by the RT	0.12	0.04	0.31	<0.001
Decision to order culture is often made by the Nurse	0.21	0.1	0.43	<0.001
Decision to order culture is often made by the APP	0.47	0.32	0.69	<0.001
Decision to order culture is often made by the Resident	0.43	0.31	0.59	<0.001
Decision to order culture is often made by the Fellow	0.55	0.32	0.93	0.03
Decision to order culture is often made by the Attending	1.02	0.65	1.6	0.94
New fever without other symptoms	0.68	0.5	0.93	0.02
Persistent fever without other symptoms	1.03	0.71	1.49	0.87
New hypotension without respiratory symptoms	1.87	1.13	3.1	0.02
Increased volume of secretions without other symptom	0.47	0.31	0.7	<0.001

Change in color or thickness of secretions without other symptoms	0.29	0.23	0.37	<0.001
Increased ventilator support without other symptoms	0.79	0.6	1.04	0.09
New opacity on chest imaging without other symptoms	0.77	0.54	1.09	0.15
New laboratory change that can be seen with infections (e.g. elevation in WBC or CRP) without other symptoms	0.34	0.24	0.48	<0.001
New fever AND laboratory changes (e.g. elevation in WBC or CRP) without respiratory symptoms	0.92	0.63	1.35	0.68
New fever AND increased secretions without increase in ventilator support	1.33	0.74	2.41	0.34
New fever AND increased ventilator/oxygen support	2.42	1.31	4.47	0.005
Request from consulting service (e.g. Oncology, Surgery, Infectious Diseases)	1.5	0.93	2.42	0.09
Request from parent/caregiver	0.93	0.7	1.25	0.65
Surveillance culture in asymptomatic patient	0.16	0.04	0.68	0.01
Respiratory culture obtained concurrent with blood and urine culture (i.e., "pan culture")	1.26	0.81	1.96	0.31
Top reason: Increased ventilator/oxygen requirement	3.68	2.27	5.96	<0.001
Top reason: Inability to wean ventilator/oxygen support	0.63	0.06	7.14	0.71
Top reason: Change in description of secretions	0.33	0.23	0.49	<0.001
Top reason: New fever	1.78	1.32	2.41	<0.001
Top reason: Persistent/recurrent fevers	0.93	0.67	1.28	0.64
Top reason: Laboratory changes (e.g. increased WBC or CRP)	0.3	0.11	0.82	0.02
Top reason: Findings on chest X-ray	1.31	0.53	3.26	0.55
I feel confident about indications to obtain a respiratory culture	0.56	0.34	0.91	0.02
All ventilated PICU patients with new fever should get a respiratory culture	0.38	0.22	0.67	<0.001
All ventilated PICU patients with increased secretions should get a respiratory culture	0.23	0.15	0.37	<0.001
Respiratory cultures are likely to grow bacteria from patients with tracheostomies	6.81	4.27	10.86	<0.001
Respiratory cultures are likely to grow bacteria from patients with endotracheal tubes	1.67	1.08	2.59	0.02

The information from respiratory cultures is useful to guide antibiotic therapy	0.42	0.2	0.9	0.03
Medication changes can influence secretion characteristics	0.69	0.43	1.12	0.13
It is easy to obtain a secretion specimen	0.74	0.48	1.14	0.17
I would find a decision support algorithm helpful	1.42	0.83	2.44	0.20
I expect I would follow a decision support algorithm	0.65	0.31	1.32	0.23
Respiratory cultures are ordered too frequently in our unit	7.29	5.11	10.41	<0.001
The attending physician is typically included in the decision-making process	0.77	0.55	1.07	0.12
Nurses are typically included in the decision-making process	1.06	0.69	1.62	0.81
Respiratory therapists are typically included in the decision-making process	1.54	1.06	2.25	0.02
Clinicians always conduct a physical exam	0.82	0.66	1.02	0.08
Clinicians always review patients' microbiology history	1.66	1.23	2.24	0.001
Clinicians always review vital signs and other clinical data (e.g. labs, X-rays)	1.33	0.97	1.83	0.08
Consulting services play an important role in the decision to order a respiratory culture	1.03	0.7	1.52	0.87
Clinicians have a low threshold to order respiratory cultures	3.05	2.21	4.22	<0.001
Respiratory culture ordering practices vary among clinicians	4.78	3.23	7.08	<0.001
Respiratory culture ordering practices vary among patient populations	3.6	2.7	4.81	<0.001
A decision support algorithm guiding when to obtain respiratory cultures would help align the ICU team and/or consulting teams	0.97	0.52	1.8	0.93
Practices vary widely between clinicians, so it will be difficult to standardize	1.9	1.42	2.54	<0.001
Some clinicians may be reluctant to change their practices	2.72	2.02	3.67	<0.001
There is insufficient evidence that respiratory cultures can be reduced safely	4.32	2.22	8.4	<0.001
Clinicians may not change practices due to concern for missing a diagnosis of ventilator-associated pneumonia or tracheitis	3.73	2.7	5.15	<0.001
It is difficult to review pertinent clinical information from the electronic medical record	1.19	0.86	1.63	0.29
It is difficult to perform physical exams prior to ordering a respiratory culture	1.22	0.64	2.35	0.55

High patient care workload may make it difficult	0.95	0.62	1.45	0.81
It is difficult to change respiratory culture practices for medically complex patients	3.18	2.35	4.29	<0.001
Opinion of consulting services may differ	1.11	0.78	1.6	0.56
Opinion of patient/caregiver may differ	0.96	0.67	1.39	0.83