

## Impact of Service Quality on Overall Patient Experience

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## Excellence in Services 21<sup>th</sup> International Conference



Excellence  
In Services  
International  
Conference

EISIC

Formerly Toulon-Verona Conference, founded in 1998

## Speaker Background

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## Collaborators

### ■ Present

- Dr. Roberta S. Russell,  
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- Dr. Quinton Nottingham,  
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### ■ Past

- Dr. Sheneeta White,  
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3

## Presentation Synopsis

Rural outpatient medical clinics



4

## Abstract

Different constructs of **psychometric variables** included *administrative process, patient flow, nurse/assistant, care provider, and patient safety and health* with multiple dimensions. Demographic variables included **gender** and **age**. **Wait time** considered time in the waiting and exam rooms. Predictive, multivariate modeling, using multiple methods, uncovered interesting findings on the true drivers of overall patient satisfaction.

5

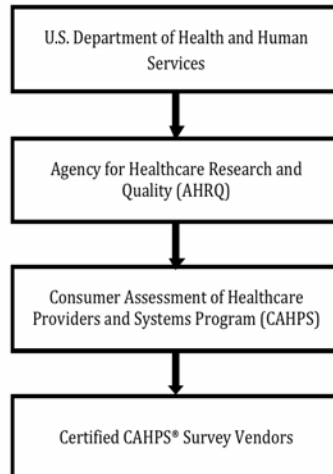
## What is Patient Experience?

**Patient experience** encompasses the *range of interactions* that patients have with the health care system, including their care from health plans, and from doctors, nurses, and staff in hospitals, physician practices, and other health care facilities. The terms patient satisfaction and patient experience are often used interchangeably, but they are not the same thing.

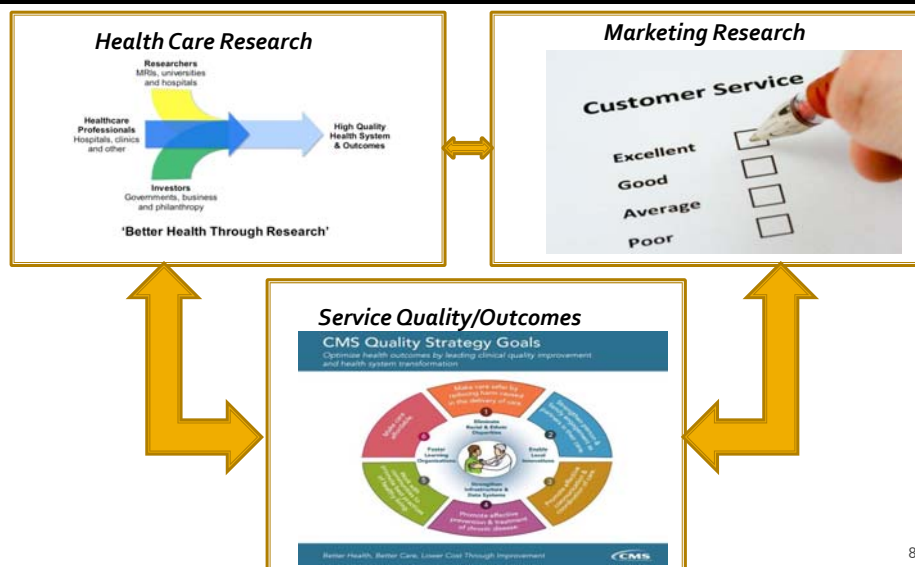
(AHRQ, <https://www.ahrq.gov/cahps/about-cahps/index.html>)

6

## Affordable Care Act (ACA) mandates patient satisfaction surveys to assess the quality of care



## Research Background



## UPHS Portage Health



- 800 employees, 2<sup>nd</sup> largest employer in region
- Over 120,000 outpatient visits yearly
- From not-for-profit to profit ownership in late 2013
- Focus is on outpatient medical clinics serving a rural community with two universities located in the region.

About Portage Health, <https://www.portagehealth.org/>  
Accessed August 1, 2018

9

## Patient-Centered Medical Home



Portage Health, Patient-Centered Medical Home <http://www.portagehealth.org/pcmh/>, accessed 3/22/2013

10

## Research Motivation

Service Quality  
(Parasuraman, et al 1985;  
Brady & Cronin, 2001)

Measure satisfaction  
(Souteriou & Hadjinicola,  
1999) and difficulty to  
evaluate service (Murdick,  
et al, 1990; Fisk, et al  
1993)

Patient satisfaction and  
quality outcomes  
influence care (Badri et al  
2008; Carter et al, 2012)

Wait time affects patient  
satisfaction (Soares &  
Farhangmehr, 2015)

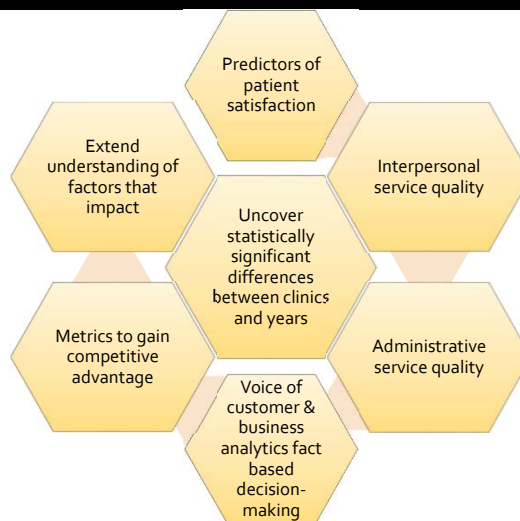
Wait time consequences  
in ED (Alijani, et al, 2015)

Lack of research regarding waiting time, care quality and patient satisfaction for outpatient clinics, different specialties in rural regions.

Johnson, D., Nottingham, Q., and Russell, R. (2018) Impact of Waiting Time on Patients' Perception on Overall Care Quality, 2018 Production and Operations Management Society Annual Conference, Houston, TX.

11

## Research Motivation



Johnson, D.M., Russell, R., and Nottingham, Q. (2016) Multi-Year SEM Model Predicting the Impact of Behavior Attributes on Overall Patient Satisfaction, presented at Production and Operations Management Society Conference, Orlando, FL. Invited presentation.

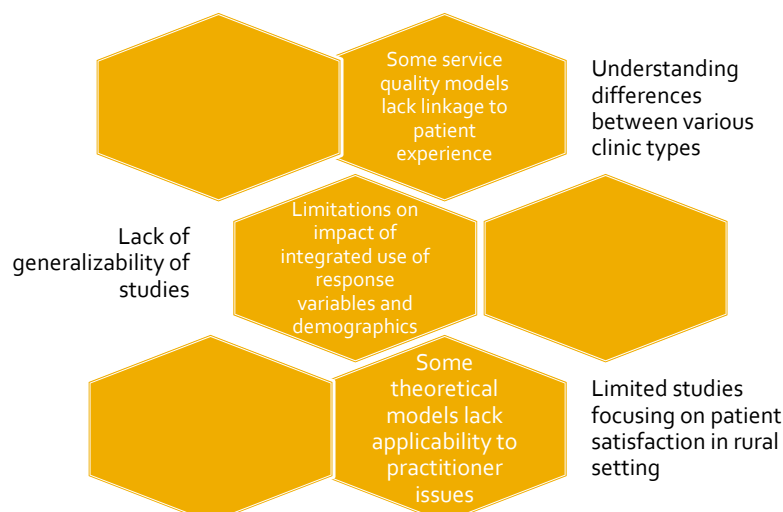
12

## Key Literature – Patient Experience

- Healthcare providers embrace a **patient-centric approach** to actively engage patient in decisions regarding care (Delnoij, et al., 2006).
- Patient satisfaction affects healthcare firms **financially** through referrals and reimbursements (Ferrand et al., 2016)
- Driven by the US **Affordable Care Act**, Medicare/Medicaid reimbursements are partially tied to patient satisfaction measures (Tefera et al., 2016)
- Analysis of **post-consumption evaluations** is one way to learn what impacts patient experience (Panchapakesan et al., 2015; Schulingkamp and Latham, 2015)
- Patient involvement and patient experience in **quality improvement** (Wiig, et al., 2013)
- Developing area of research regarding service quality and patient experience for **outpatient clinics in a rural setting**.

Nottingham, Q., Johnson, D.M., and Russell, R.S. (2017) Psychometric Attributes Impact on Patient Experience: Are There Differences Between Medical Clinics? presented at 48<sup>th</sup> Annual Meeting of Decision Sciences Institute, Washington, DC. Invited presentation. 13

## Key Literature – Gaps



Nottingham, Q., Johnson, D.M., and Russell, R.S. (2017) Psychometric Attributes Impact on Patient Experience: Are There Differences Between Medical Clinics? presented at 48<sup>th</sup> Annual Meeting of Decision Sciences Institute, Washington, DC. Invited presentation. 14



## Key Literature – Wait Time & Patient Satisfaction

Longer than 15 minutes – 94% patient dissatisfaction (Eilers, 2004)

ED & specialty clinics (Alijani et al, 2015)

Wait time was measured from check in until seeing provider (Hill and Joonas, 2005; McMullen and Netland, 2013)

Wait time up, dissatisfaction increases (Hensley and Sulek, 2007)

Lengthy wait has significant impact on patient satisfaction (Soares and Farhangmehr, 2015)

Wait less, patient satisfaction up (Camacho et al, 2006)

Wait time negative impact on satisfaction (Bielen and Demoulin, 2007)

Johnson, D., Nottingham, Q., and Russell, R. (2018) Impact of Waiting Time on Patients' Perception on Overall Care Quality, 2018 Production and Operations Management Society Annual Conference, Houston, TX.

15

## Key Literature – Wait Time Gaps

Much of the research on patient wait times was completed prior to ACA and pay for performance initiatives

Much of the research on patient wait times is for emergency care in hospitals

Varying definitions of 'wait time' make generalizations of prior research difficult

Research today uses CMS survey questions for comparison

Different types of medical facilities (clinics vs hospitals)

Different types of medical/clinic specialties

Johnson, D., Nottingham, Q., and Russell, R. (2018) Impact of Waiting Time on Patients' Perception on Overall Care Quality, 2018 Production and Operations Management Society Annual Conference, Houston, TX.

16



## Key Literature Characterization of Psychometric Attributes Based on Prior Research

Author(s)	Related Research Findings	Psychometric Dimension(s)
Kupfer and Bond, 2012	Closing gap between patient's expectations	OPS
Bowling et al., 2013	Patient experiences in delivery of service transaction informs care provider about emotional and human features	CP
Hendriks et al., 2009	Patient experiences identified as key indicator for evaluating and improving internal processes	AP, PF, PSH, CP
Suhonen et al., 2012; Mainz 2003; Larsson and Wilde-Larsson, 2010	Patient experiences identified as key indicator for evaluating and improving overall quality of care	AP, PF, PSH, CP, NA, OPS
Badri et al., 2009; Carter et al., 2010	Patient satisfaction and quality outcomes are influenced by care quality	CP
Venkataraman, 2015; Price et al., 2014	Drivers of patient satisfaction does not require cost and quality trade-off as the service quality attributes are not costly to modify	AP, PF, PSH
Price et al., 2014	Care quality results in better patient experiences and improved overall satisfaction	CP
Ferrand et al., 2016	Prior research lacks a theoretical underpinning to link satisfaction attributes to healthcare system practices	All

**Key:** Administrative Processes (AP); Patient Flow (PF); Patient Safety and Health (PSH); Care Provider (CP); Nurse/Assistant (NA); Overall Patient Satisfaction (OPS)

Nottingham, Q., Johnson, D.M., and Russell, R. (2018) "Multi-year SEM model predicting the impact of behavior attributes on overall patient satisfaction," *International Journal of Quality and Reliability Management*, forthcoming.

17

## Prior Research Analytics

<i>Basic statistics and regression (Russell, et al., 2015)</i>	<i>Conjoint methodology employed (Carman, 2000)</i>
<i>Factor analysis (Johnson and Russell, 2015; Tucker, 2002; Kilbourne et. al., 2004)</i>	<i>AHP to determine best healthcare service quality performance based on SERVQUAL – case study of healthcare in Turkey (Büyükožhan, et al., 2011)</i>
<i>Outpatient clinic in Southern California using a questionnaire based on SERVPERF, analysis and modeling included CFA, OLS, and optimization (Souteriou and Chase, 2000)</i>	<i>Service quality using PCA and fuzzy set theory based decision model to calculate overall quality and effectiveness (Büyükožhan, et. al. 2011; Wu, et al., 2004)</i>
<i>Structural equation model of service quality, (Ancarani, et. al. 2011; Johnson and Russell, 2015; Marley et. al. 2004; Scotti, et. al. 2007; Cengiz and Kirkbir, 2007 ; Choi, et al., 2004)</i>	

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18

## Research Program Studies

- Emphasis on **process** and **interpersonal quality** as opposed to technical quality
- Psychometric **service quality** variables impact on **overall patient satisfaction**
- Analysis of age, gender, clinic type, provider type, and medical specialty
- Opportunity to understand impact of **waiting times** on patient perceptions of care quality and likelihood of recommending care provider and practice
- Patient Centered Outcomes Research (PCOM) which identify areas to **improve process quality** and **increase patient satisfaction**
- **Multi-year study** – fiscal years 2012, 2013, 2014
- **Rural healthcare** setting of multiple outpatient clinics and physician offices

19

## Defining Quality - Categories

### *The use of psychometric variables categorized as follows:*

**Interpersonal service quality** refers to degree and quality of interaction between the customer and service provider, including trust, communication and manner or attitude; which is generally the primary focus of patients (Panchapakesan et al., 2015; Kupfer and Bond, 2012; Mann et al., 2016). Also referred to as **process quality**.

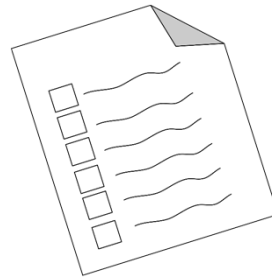
**Administrative service quality** facilitates core services by adding value to the customer's experience (McDougall and Levesque, 1994; Dagger et. al. 2007). Also referred to as **process quality**.

**Technical service quality**, generally patients lack the professional expertise to evaluate clinical quality, and care providers may not view the patient's evaluation as valid (Nash, 2015). Panchapakesan et al., (2015) indicate that patients often take for granted the **technical service quality**.

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## Research Methodology

- Likert scaled attitudinal survey instrument
- Press Ganey
- Similar question to those found in CAHPS surveys
- Medical Practice Group
- Created in 1990's updated in 2010
- Thirty-six questions
- Demographics



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## Research Methodology

- 36 question survey
  - 32 independent variables in the following categories
    - Administrative Processes
    - Patient Flow
    - Nurse/Assistant
    - Care Provider
    - Patient Safety and Health
  - 4 dependent variables – Overall assessment



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## Survey Focus Areas

- **Administrative Processes** (a1- a7) – helpfulness, promptness, courtesy, convenience, ease of reaching the clinic by phone and ease of scheduling appointments [Russell, et al, 2015; Baker, et al, 2008]
- **Patient Flow** (v1-v7) – speed of registration; **wait times in waiting room, in exam room, and at clinic**; **information about delays**; comfort and pleasantness of waiting room and exam room [Russell, et al, 2015; Litvak, 2009; Villa, et al, 2009; Cassady-Smith, et al, 2007]
- **Nurse/Assistant** (n1-n2) – friendliness, courtesy, concern of nurse/assistant [Russell, et al, 2015]
- **Care Provider** (cp1-cp10) - friendliness, courtesy, concern of care provider; explanations, information, instructions, clear language; **time with patient**; patient confidence; **recommend** [Russell, et al, 2015]
- **Patient Safety and Health** (i1-i6) – cleanliness, safety, security, privacy, sensitivity to patient needs, pain control [Russell, et al, 2015]

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## Research Questions

Does service quality impact overall patient satisfaction?

Does it vary by clinic type?

Does it vary by year?

Are there differences based on gender, age group, clinic type, or physician?

Does waiting time have an impact?

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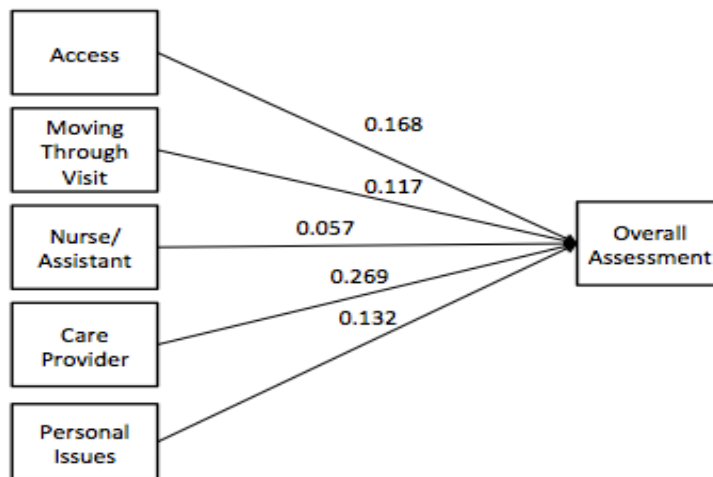
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## Research Program Analytics

- Descriptive statistics
  - ANOM for equality of means
  - Student's t-test
  - ANOVA F-test
  - Tukey's HSD
  - Contingency table analysis
  - Welch's test
  - Pearson chi-square test
  - Somers' D
- Multiple regression
  - Confirmatory factor analysis
  - Structural equation modeling (SEM)
  - Logistic regression
  - Ordinal logistic regression

25

## Initial Theoretical Framework - 2012



Russell, R.S., Johnson, D.M., and White, S.W. (2015) "Patient perceptions of quality: analyzing patient satisfaction surveys," *International Journal of Operations and Production Management*, Vol. 35, No. 8, pp. 1-26.

26

## Regression Results for Combined Data 2012-2014 (o3 and o4)

#	Variable	DF	Regression Coefficient	Standard Error	t Ratio	Prob >  t	R <sup>2</sup>
<b>o3</b>	<b>Care received during a visit</b>	10					<b>0.778</b>
	INTERCEPT		-0.1370	0.0438	-3.13	0.0018	
cp2	CP explanations of problem/condition	1	0.0464	0.0140	3.32	0.0009	
cp3	CP concern for questions/worries	1	0.0784	0.0148	5.31	<.0001	
<b>cp4</b>	<b>CP includes patient in decisions</b>	1	0.0643	0.0136	4.73	<.0001	
<b>cp6</b>	<b>CP instructions for follow-up care</b>	1	0.0558	0.0109	5.10	<.0001	
<b>cp9</b>	<b>Patient confidence in CP</b>	1	0.1532	0.0129	11.92	<.0001	
i2	Our sensitivity to patient needs	1	0.0672	0.0115	5.82	<.0001	
n1	Friendliness/courtesy of nurse/asst.	1	0.0589	0.0111	5.29	<.0001	
<b>o1</b>	<b>Cheerfulness of practice</b>	1	0.1273	0.0123	10.38	<.0001	
<b>o2</b>	<b>Staff worked well together</b>	1	0.3398	0.0130	26.18	<.0001	
v3	Wait time at clinic	1	0.0424	0.0061	7.00	<.0001	
<b>o4</b>	<b>Likelihood of recommending practice</b>	15					<b>0.731</b>
	INTERCEPT		-0.3155	0.0549	-5.75	<.0001	
<b>cp4</b>	<b>CP includes patient in decisions</b>	1	0.0520	0.0148	3.50	0.0005	
cp5	CP information about medications	1	-0.0502	0.0138	-3.64	0.0003	
<b>cp6</b>	<b>CP instructions for follow-up care</b>	1	0.0823	0.0136	6.06	<.0001	
<b>cp9</b>	<b>Patient confidence in CP</b>	1	0.3329	0.0139	23.97	<.0001	
i2	Our sensitivity to patient needs	1	0.0894	0.0144	6.20	<.0001	
i6	Safety/security felt at practice	1	0.1011	0.0153	6.61	<.0001	
n1	Friendliness/courtesy of nurse/asst.	1	0.0680	0.0178	3.83	0.0001	
n2	Concern of nurse/asst. for problem	1	-0.0490	0.0161	-3.05	0.0023	
<b>o1</b>	<b>Cheerfulness of practice</b>	1	0.1325	0.0146	9.07	<.0001	
<b>o2</b>	<b>Staff worked well together</b>	1	0.2774	0.0153	18.14	<.0001	
v5	Wait time before going to exam room	1	0.0335	0.0077	4.37	<.0001	

Note: Dependent variables are shaded. Variables appearing in both models o3 and o4 are **bolded**. CP = care provider. Variables entered the model at <.05 level of significance.

Johnson, D.M. Russell, R.S., and White, S.W. (2016) "Perceptions of care quality and the effect on patient satisfaction," *International Journal of Quality and Reliability Management*, Vol. 33, No. 8, pp. 1202-1229.

27

## Summary of Hypothesis Tests, H1-H5 – IJOPM (2015) & IJQRM (2016)

Hypothesis	Methodology	Overall rating of care received during visit (o3)	Likelihood of your recommending our practice to others (o4)
H1: Administrative Processes (Access) do not significantly affect overall patient satisfaction.	Multiple Regression	Fail to Reject Reject 2012	Fail to Reject Reject 2012
H2: Patient Flow (Moving Through Visit) does not significantly affect overall patient satisfaction.	Multiple Regression	Reject	Reject
H3: Nurses/Assistants do not significantly affect overall patient satisfaction.	Multiple Regression	Reject	Reject
H4: Care Providers do not significantly affect overall patient satisfaction.	Multiple Regression	Reject	Reject
H5: Patient Safety and Health (Personal Issues) do not significantly affect overall patient satisfaction.	Multiple Regression	Reject	Reject

Staff worked well together (o2) was a dependent variable in IJOPM study whereas it was used as an independent variable in the IJQRM study

Russell, R.S., Johnson, D.M., and White, S.W. (2015) "Patient perceptions of quality: analyzing patient satisfaction surveys," *International Journal of Operations and Production Management*, Vol. 35, No. 8, pp. 1-26.

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28

## Summary of Hypothesis Tests, H6-H10 – IJOPM (2015) & IJQRM (2016)

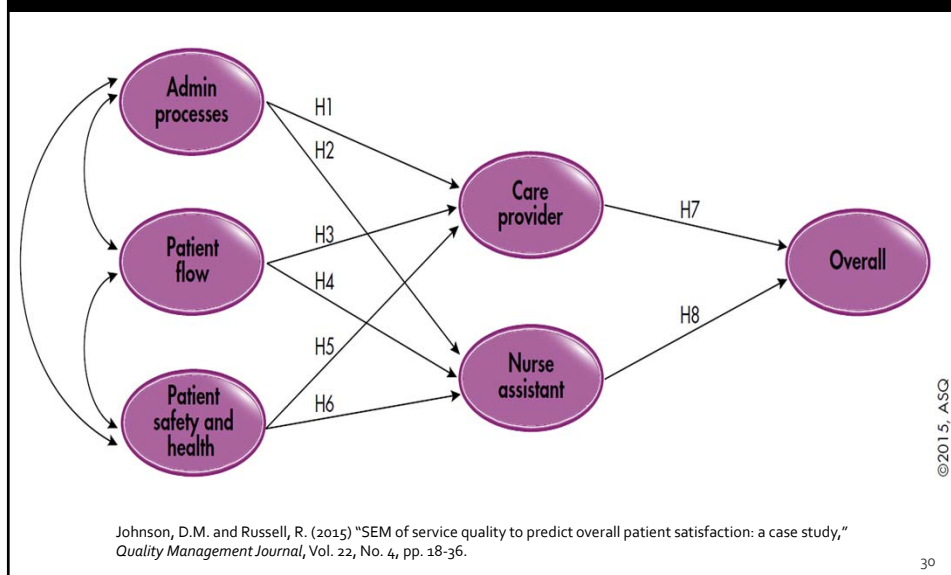
Hypothesis	Methodology	Overall rating of care received during visit (o3)	Likelihood of your recommending our practice to others (o4)
H6: There is no statistically significant difference in overall patient satisfaction based on <i>gender</i> .	ANOVA F-test Tukey HSD	Fail to Reject Reject 2012	Fail to Reject Reject 2012
H7: There is no statistically significant difference in overall patient satisfaction based on <i>age group</i> .	ANOM Tukey HSD	Reject	Reject
H8: There is no statistically significant difference in overall patient satisfaction based on <i>clinic type</i> .	ANOVA F-test Tukey HSD	Reject	Reject
H9: There is no statistically significant difference in overall patient satisfaction based on <i>provider type</i> .	ANOVA F-test ANOM Tukey HSD	Reject	Fail to Reject
H10: There is no statistically significant difference in overall patient satisfaction based on <i>medical specialty</i> .	ANOVA F-test ANOM Tukey HSD	Reject Fail to Reject 2014	Reject Fail to Reject 2014

Staff worked well together (o2) was a dependent variable in IJOPM study whereas it was used as an independent variable in the IJQRM study

Russell, R.S., Johnson, D.M., and White, S.W. (2015) "Patient perceptions of quality: analyzing patient satisfaction surveys," *International Journal of Operations and Production Management*, Vol. 35, No. 8, pp. 1-26.

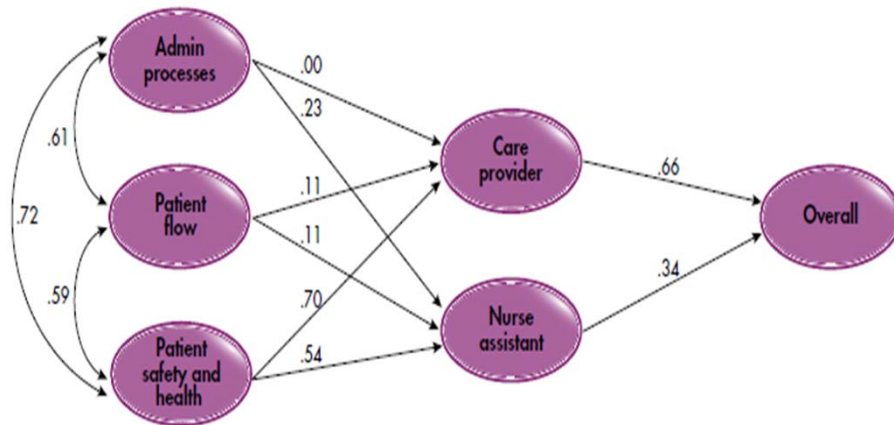
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## Hypothesis – QMJ 2015





## Measurement Model with Standardized Estimates



Johnson, D.M. and Russell, R. (2015) "SEM of service quality to predict overall patient satisfaction: a case study," *Quality Management Journal*, Vol. 22, No. 4, pp. 18-36.

31

## Outcome of Hypotheses Tests – 2012 Data

**Table 8** Maximum likelihood estimates, p value, and outcome of hypotheses test

Path	Standardized regression weights	p-value	Result
Administrative processes → Care provider	−0.002	0.943	H1 is not supported
Administrative processes → Nurse assistant	0.229	***	H2 is supported
Patient flow → Care provider	0.106	***	H3 is supported
Patient flow → Nurse assistant	0.112	***	H4 is supported
Patient safety and health → Care provider	0.697	***	H5 is supported
Patient safety and health → Nurse assistant	0.540	***	H6 is supported
Care provider → Overall	0.662	***	H7 is supported
Nurse assistant → Overall	0.337	***	H8 is supported

\*\*\* indicates  $p < 0.001$

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32

# Confirmatory Factor Analysis – All Years

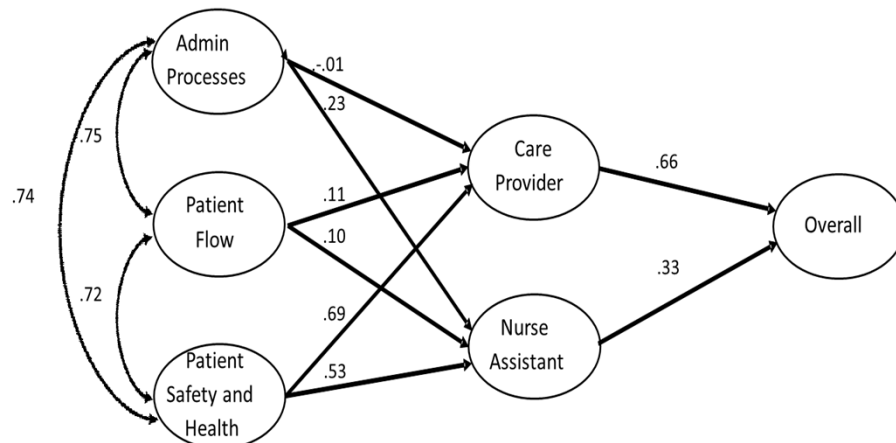
**Table 7** Confirmatory factor analysis results

Table 7. Confirmatory factor analysis results		Question abbreviation	Factor loadings	Cronbach's alpha	Eigenvalues	Explained variation
<b>Factor 1: Care provider</b>						
cp3	Concern the care provider showed for your questions or worries	Concern for patient	0.8722	0.9682	8.3884	26.21
cp9	Your confidence in this care provider	Confid in provider	0.8602			
cp10	Likelihood of your recommending this care provider to others	Likely to recomm	0.8532			
cp2	Explanations the care provider gave you about your problem or condition	Care prov explain	0.8450			
cp4	Care provider's efforts to include you in the decisions about your treatment	Treatment decision	0.8427			
cp8	Amount of time the care provider spent with you	Time with patient	0.7868	0.9155	5.2230	16.34
cp6	Instructions the care provider gave you about follow-up care (if any)	Instructions	0.7859			
cp7	Degree to which care provider talked with you using words you could understand	Clear language	0.7791			
cp1	Friendliness/courtesy of care provider	Courtesy CP	0.7728			
cp5	Information the care provider gave you about medications (if any)	Info on meds	0.7469			
<b>Factor 2: Administrative processes</b>						
a2	Our helpfulness on the telephone	Telephone help	0.7987	0.8956	4.2726	13.35
a1	Ease of getting through to the clinic on the phone	Clinic by phone	0.7921			
a5	Ease of scheduling your appointment	Schedule appt	0.7478			
a3	Our promptness in returning your phone calls	Return phone call	0.7208			
a6	Courtesy of person who scheduled your appointment	Courtesy appt	0.7056			
a7	Convenience of office hours	Office hours	0.6841	0.8956	4.2726	13.35
a4	Courtesy of staff in the registration area	Courtesy check in	0.6184			
<b>Factor 3: Patient flow</b>						
v3	Wait time in clinic (from arrive to leaving)	Wait time total	0.8506	0.8956	4.2726	13.35
v5	Length of wait before going to an exam room	Wait area time	0.8159			
v7	Waiting time in exam room before being seen by the care provider	Wait time exam rm	0.7284			
v2	Degree to which you were informed about any delays	Informed delay	0.7209			
v4	Comfort and pleasantness of the waiting area	Wait area comfort	0.6087			
<b>Factor 4: Patient safety and health</b>						
i1	How well staff protected your safety (by washing hands, wearing gloves, etc.)	Staff safety	0.7258	0.9301	4.0992	12.81
i3	Our concern for your privacy	Privacy	0.7188			
i4	Cleanliness of our practice	Cleanliness	0.7182			
i2	Our sensitivity to your needs	Sensitivity	0.6483			
i6	Safety and security you felt at this practice	Safety and security	0.6214			
<b>Factor 5: Nurse assistant</b>						
n1	Friendliness/courtesy of the nurse/assistant	Courtesy nurse/asst	0.7402	0.9115	1.7032	5.32
n2	Concern the nurse/assistant showed for your problem	Concern nurse/asst	0.6691			
Total explained variation					74.03	

Johnson, D.M. and Russell, R. (2015) "SEM of service quality to predict overall patient satisfaction: a case study," *Quality Management Journal*, Vol. 22, No. 4, pp. 18-36.

33

## SEM – IJQRM - 2018



Nottingham, Q., Johnson, D.M., and Russell, R. (2018) "Multi-year SEM model predicting the impact of behavior attributes on overall patient satisfaction," *International Journal of Quality and Reliability Management*, forthcoming.

34

## Maximum Likelihood Estimates, p-values, & Outcome of Hypothesis Tests for Consolidated Model

Path	Standardized Regression Weights	p	Result
Administrative Process --> Care Provider	-0.014	0.691	H1 is not supported
Administrative Process --> Nurse Assistant	0.226	***	H2 is supported
Patient Flow --> Care Provider	0.106	0.002	H3 is supported
Patient Flow --> Nurse Assistant	0.102	0.004	H4 is supported
Patient Safety and Health --> Care Provider	0.691	***	H5 is supported
Patient Safety and Health --> Nurse Assistant	0.529	***	H6 is supported
Care Provider --> Overall	0.66	***	H7 is supported
Nurse Assistant --> Overall	0.331	***	H8 is supported
*** Indicates p < 0.001			

Nottingham, Q., Johnson, D.M., and Russell, R. (2018) "Multi-year SEM model predicting the impact of behavior attributes on overall patient satisfaction," *International Journal of Quality and Reliability Management*, forthcoming.

35

## Model Fit Summary for Consolidated Model

Baseline Comparisons					
Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Default model	0.922	0.915	0.925	0.919	0.925
Saturated model	1		1		1
Independence model	0	0	0	0	0
<b>RMSEA</b>					
0.069					
Parsimony-Adjusted Measures					
Model	PRATIO	PNFI	PCFI		
Default model	0.92	0.848	0.851		
Saturated model	0	0	0		
Independence model	1	0	0		

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36

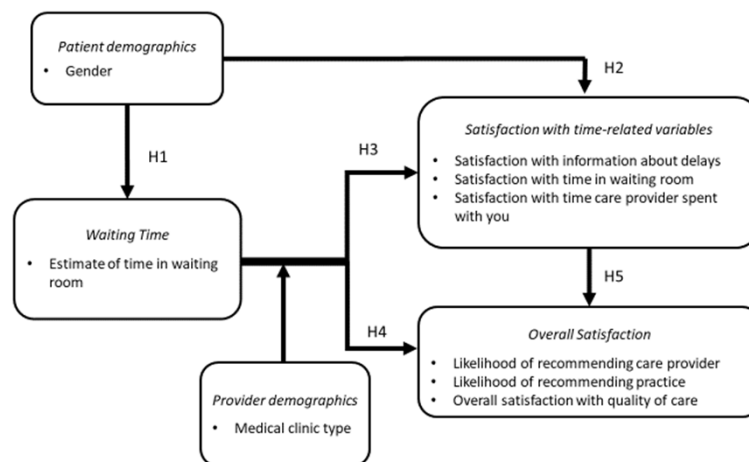
## Survey Variables Included In Study – QMJ 2018

Independent Variables (IV)		Type
waitrm	Time spent in the waiting room (self-reported)	Continuous
gender	Male / Female	Nominal
v2	Degree to which you were informed about any delays	Ordinal
v5	Length of wait before going to an exam room	Ordinal
cp8	Amount of time the care provider spent with you	Ordinal
Dependent Variables (DV)		
o3	Overall rating of quality of care received during visit	Ordinal
o4	Likelihood of your recommending our practice to others	Ordinal
cp10	Likelihood of your recommending this care provider to others.	Ordinal
Control Variables (CV)		
itclinic	Medical clinic type	Nominal

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37

## Conceptual Model – QMJ 2018



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38

## Summary of Hypothesis Tests

Hypothesis	Methodology	Result of Hypothesis Test	Discussion
H1: Waiting time estimates are significantly different by gender.	Student's t-test	Reject	There is no significant difference by gender.
H2: Patient satisfaction with time-related variables is significantly different by gender.	Student's t-test	Reject	There is no significant difference by gender.
H3a: Satisfaction with information about delays is significantly related to waiting time.	Pearson's chi-square Ordinal logistic regression	Failure to reject	Control variable – clinic type; Longer the wait, the rating decreases
H3b: Satisfaction with time in the waiting room is significantly related to waiting time.	Pearson's chi-square Ordinal logistic regression	Failure to reject	Control variable – clinic type; Longer the wait, the rating decreases
H3c: Satisfaction with the time a care provider spent with a patient is significantly related to waiting time.	Pearson's chi-square Ordinal logistic regression	Failure to reject	Control variable – clinic type; Longer the wait, the rating decreases
H4: Overall patient satisfaction is significantly related to waiting time.	Pearson's chi-square Ordinal logistic regression Somer's D	Failure to reject	
H5: Overall patient satisfaction is significantly related to satisfaction with waiting time, information about delays, and time spent with the care provider.	Pearson's chi-square Ordinal logistic regression Somer's D	Failure to reject	

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39

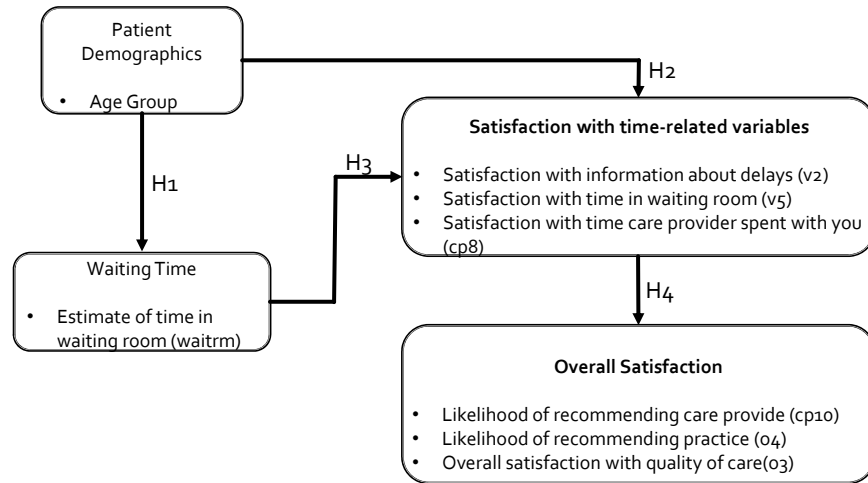
## Variables Selected for Waiting Time Model – Recent Study

- Independent variables
  - Time spent in the waiting room (self-reported) (continuous)
  - Informed of wait (v2) (ordinal)
  - Satisfaction with wait in waiting room (v5) (ordinal)
  - Amount of time care provider spent with you (cp8) (ordinal)
  - Age Group (ordinal)
- Dependent variables
  - Likelihood of recommending care provider (cp10) (ordinal)
  - Likelihood of recommending practice (o4) (ordinal)
  - Care received during visit (o3) (ordinal)

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40

## Conceptual Model – Recent Study



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41

## Summary of Hypothesis Tests

Hypothesis	Methodology	Result of Hypothesis Test/Discussion
H1: Waiting time estimates are significantly different by age group.	Tukey's HSD	<i>Fail to reject</i> There is a significant difference between 75+ and 55-64 and 65-74. <i>Reject</i> There is no significant difference for patients under 75.
H2: Patient satisfaction with time-related variables is significantly different by age group.	Ordinal Logistic Regression	<i>Reject</i> Satisfaction with time care provider spent with you (cp8): No significant difference between age groups <i>Fail to reject</i> Satisfaction with information about delays (v5): Only significant difference between patients of ages 55-64 and 65-74. <i>Fail to reject</i> Satisfaction with waiting time (v2): Significant difference between patients of ages 35-44 & 45-54; significant difference between patients of ages 55-64 & 65-74.
H3: Satisfaction with time-related variables is significantly related to wait time.	Ordinal Logistic Regression Pearson's Chi Square	<i>Fail to reject</i> The variable "time spent in the waiting room" is not significant in predicting overall patient satisfaction (o3, o4, and cp10). Time-related variables play a bigger role than in predicting overall patient satisfaction than "time spent in the waiting room."
H4: Overall patient satisfaction is significantly related to satisfaction with waiting time, information about delays, and time spent with the care provider.	Ordinal Logistic Regression Contingency Table Analysis Somer's D	<i>Fail to reject</i> The variable "time spent in the waiting room" is not significant in predicting overall patient satisfaction (o3, o4, and cp10). Therefore, the time-related variables play a bigger role than in predicting overall patient satisfaction than "time spent in the waiting room."

Johnson, D., Nottingham, Q., and Russell, R.(2018) Impact of Waiting Time on Patients' Perception on Overall Care Quality, 2018 Production and Operations Management Society Annual Conference, Houston, TX.

42

## Comparison of Findings

- Individual questions versus factors and difference in models
- **Administrative process** had no to minimal impact on overall patient satisfaction in all models in single and multi-years; as individual variables or as a latent variable.
- When using SEM, demographic variables as moderators uncovered no relationships. Similar regression weights for SEM models between 2012 and consolidated models. **Patient safety and health** psychometric variables had greatest weights through mediators affecting overall patient satisfaction.
- Express Care and OBGYN poorer scores
- Smaller clinics and smaller medical clinic types proved to have higher patient satisfaction.
- When using multi year data, there were more differences found between different clinic types (see slide 29 psychometric)

43

## Comparison of Findings

- In all waiting time related models **gender** did not impact overall patient satisfaction. When waiting time was factored in, differences were uncovered indicating males were less tolerant of delays and did impact satisfaction. This was uncovered when post-hoc analysis occurred using probability grids. Evidence in prior studies had indicated gender differences (Abro and Jalbani, 2012; Qin et al., 2017)
- In all models, there were statistically significant differences in **age** with more favorable impressions from older age groups (Over 55).
- The longer patients waited in the waiting room with the presence of **medical clinic** as a control variable, the rating given decreases.
- In the waiting time related models, although some of the relationships changed along with gender and age analyzed individually, there was no difference in outcomes as no new statistically significant relationships were found.
- When age and gender were analyzed simultaneously in time related models, there were no additional findings.

44



## Implications of Results

- Change in ownership and executive management impeded the ***continuous improvement*** and ***enhanced management decision making*** that was initially intended.
- Additional ***analytics*** beyond what the survey vendor provided in the way of summary reports.
- Previous studies had mixed results in evaluating the effect of waiting time on patient satisfaction. This study ***uncovered some nuances in the relationship***.
- ***Waiting time*** affects ***patient referrals*** of the practice more than that of the care provider.
- Average times are not sufficient in evaluating the effect of waiting; a distribution of times produces better results.

45

## Caveats

- Initial studies used the null hypothesis and later studies used the alternate hypothesis – caution in analysis.
- Survey biases and nonrespondents
- Lowest average for a question was 4.5 out of 5.0
- Mail survey impacts response rate in certain age groups
- Women and older patients tend to respond to surveys at a higher rate
- Rural population
- Competition
- Generalizability

46

## Future Research

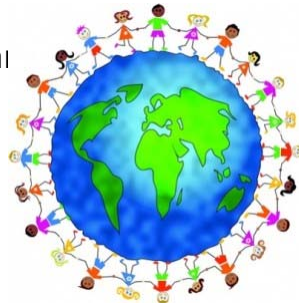


- Rural healthcare medical clinics
- Aspirus Healthcare System based out of Wisconsin, USA with operations in Western Upper Peninsula of MI
- Clinician & Group Consumer Assessment of Healthcare Providers and Systems (CGCAHPS)
- Patient experience research
- Telephone surveys
- 2015-2018, 3,000+ observations
- Similar and different questions from UPHS Portage

47

## Future Research

- Rural vs urban tolerance for waiting could be an interesting study
- Other rural regions in United States
- Developing nations
  - Shortages of health care specifically specialists
  - Global issue



48

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49

## Questions???



50

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51

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52

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54

## Presentations to Date

- Johnson, D., Nottingham, Q., and Russell, R. (2018) Impact of Waiting Time on Patients' Perception on Overall Care Quality, *2018 Production and Operations Management Society Annual Conference*, Houston, TX.
- Nottingham, Q., Johnson, D.M., and Russell, R.S. (2017) Psychometric Attributes Impact on Patient Experience: Are There Differences Between Medical Clinics? presented at *48<sup>th</sup> Annual Meeting of Decision Sciences Institute*, Washington, DC. Invited presentation.
- Nottingham, Q., Johnson, D.M., and Russell, R.S. (2017) Multi-Year Model Predicting Patient Satisfaction Based on Wait Time, presented at *2017 Production and Operations Management Society Conference*, Seattle, WA. Invited presentation.
- Johnson, D.M., Russell, R., and Nottingham, Q. (2016) Multi-Year SEM Model Predicting the Impact of Behavior Attributes on Overall Patient Satisfaction, presented at *Production and Operations Management Society Conference*, Orlando, FL. Invited presentation.
- White, S., Russell, R., and Johnson, D.M. (2016) A Decision Support System Analyzing Patient Satisfaction Surveys, presented at *Production and Operations Management Society Conference*, Orlando, FL.
- Johnson, D.M., Russell, R., and White, S. (2015) Multi-Year Multivariate Modeling of Service Quality and Patient Satisfaction, presented at *Production and Operations Management Society*, Washington, DC.
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- Johnson, D.M. and Russell, R. (2013) Patient perceptions of quality, presented at *2013 Production and Operations Management Society (POMS) Conference*, Denver, CO.

55

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- Nottingham, Q., Johnson, D.M., and Russell, R. (2018) "Multi-year SEM model predicting the impact of behavior attributes on overall patient satisfaction," *International Journal of Quality and Reliability Management*, forthcoming.
- Nottingham, Q., Johnson, D.M., and Russell, R.S. (2018) "Effect of waiting time on patient perceptions of care quality," *Quality Management Journal*, Special Issue on Health Care Quality Management, Vol. 25, No. 1, pp. 1-14.
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56