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# Progressive Visual Analytics

User-Driven Visual Exploration  
of In-Progress Analytics

Chad Stolper  
Georgia Tech

Adam Perer  
IBM T.J. Watson  
Research Center

David Gotz  
UNC Chapel Hill

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# Visual Analytics Workflow

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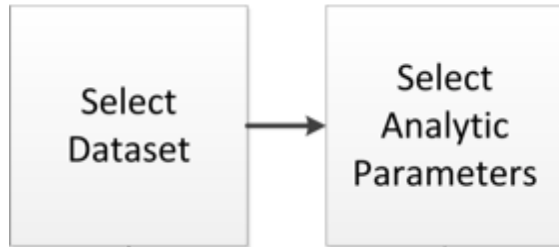
# Visual Analytics Workflow



Select  
Dataset

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# Visual Analytics Workflow



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# Visual Analytics Workflow



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# Visual Analytics Workflow



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# Visual Analytics Workflow



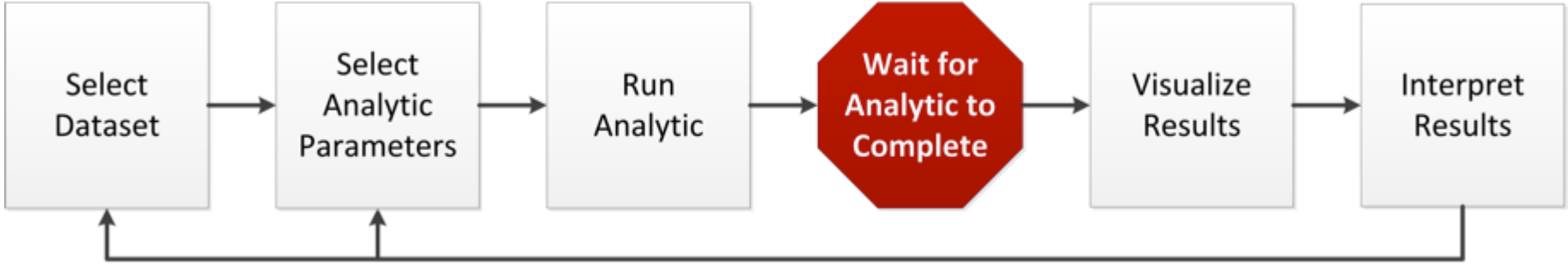
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# Visual Analytics Workflow

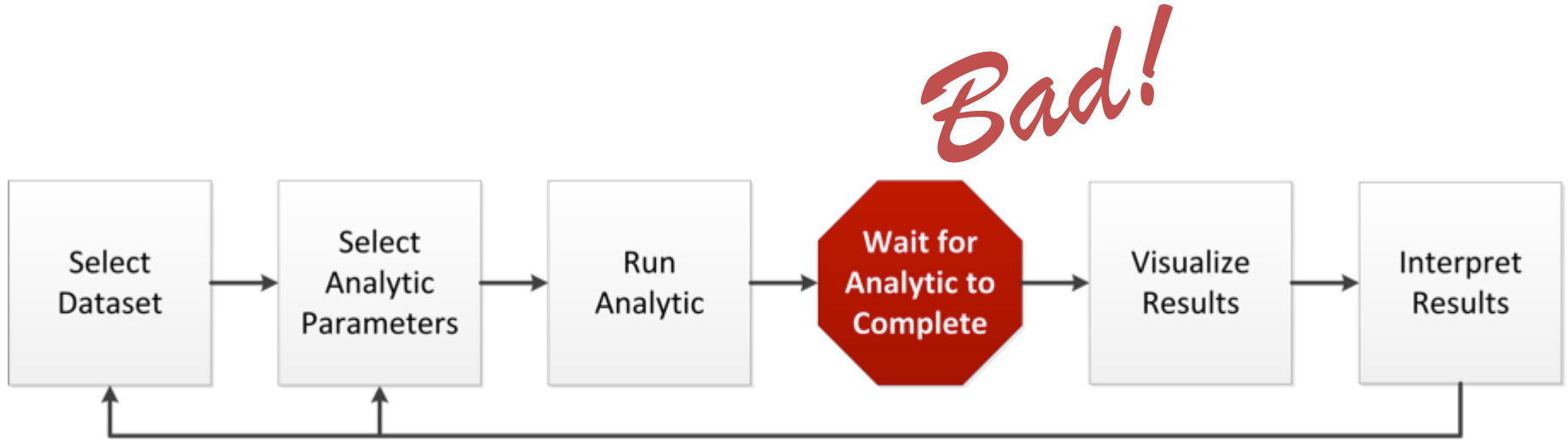




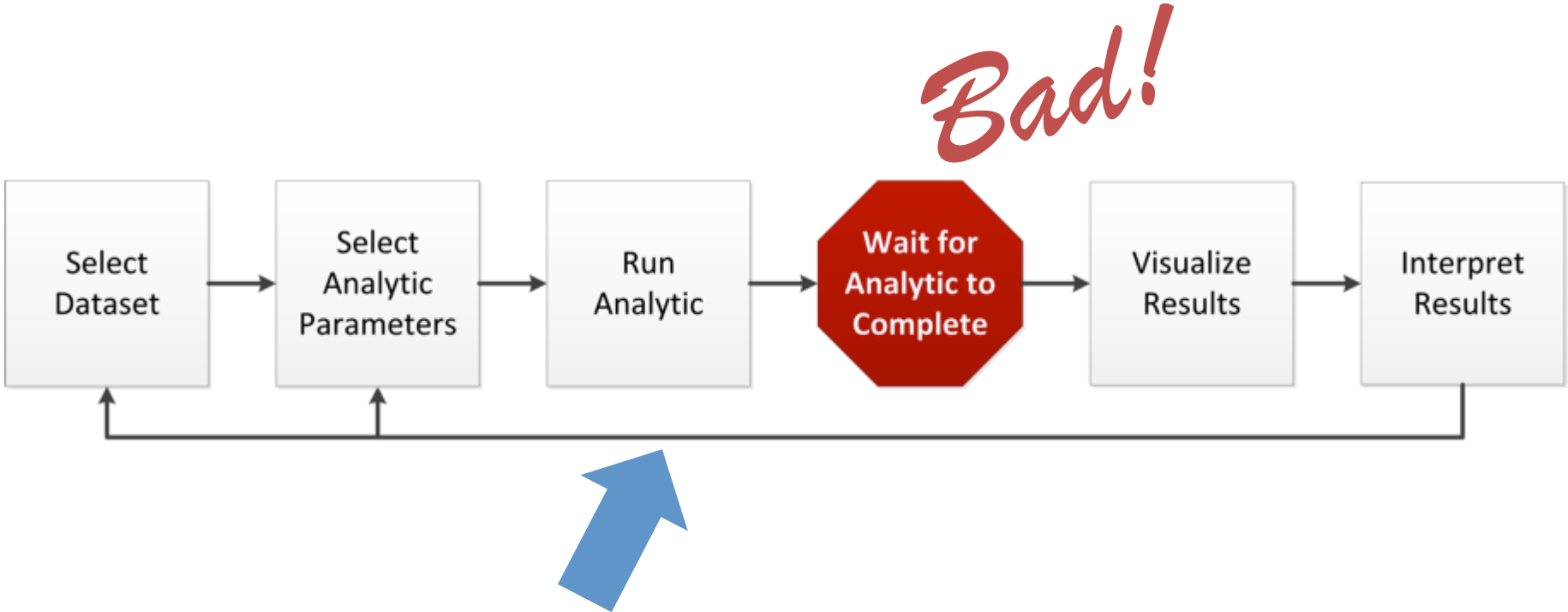
# Visual Analytics Workflow



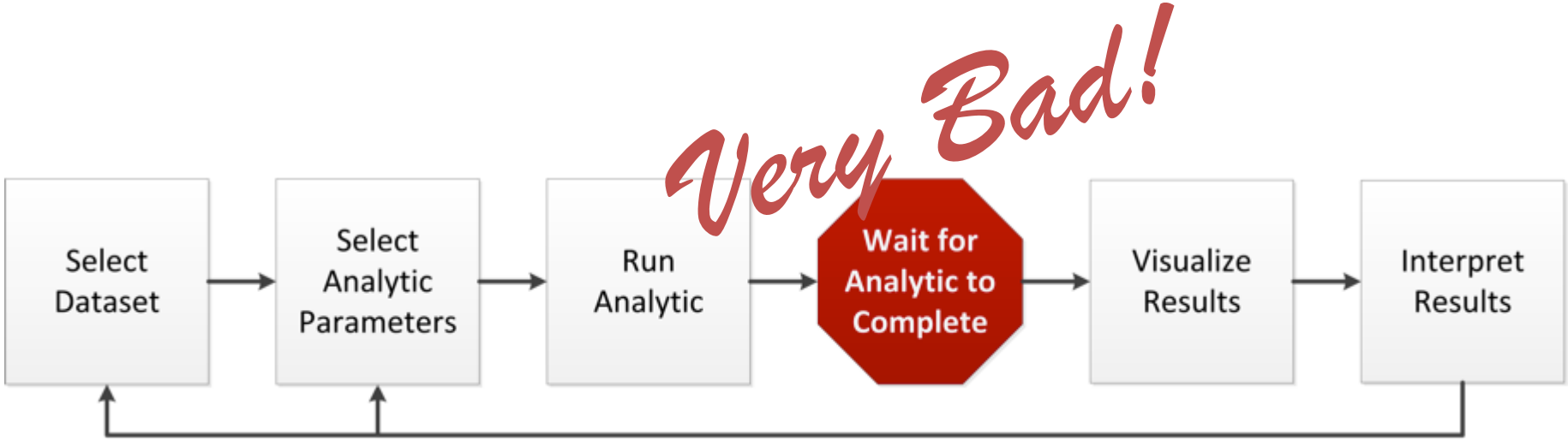
# Visual Analytics Workflow



# Visual Analytics Workflow



# Visual Analytics Workflow





<https://www.flickr.com/photos/veggiefrog/3435380297/>

1. Increasingly large quantities of data



<https://www.flickr.com/photos/veggiefrog/3435380297/>

1. Increasingly large quantities of data
2. Increasingly complex analytics



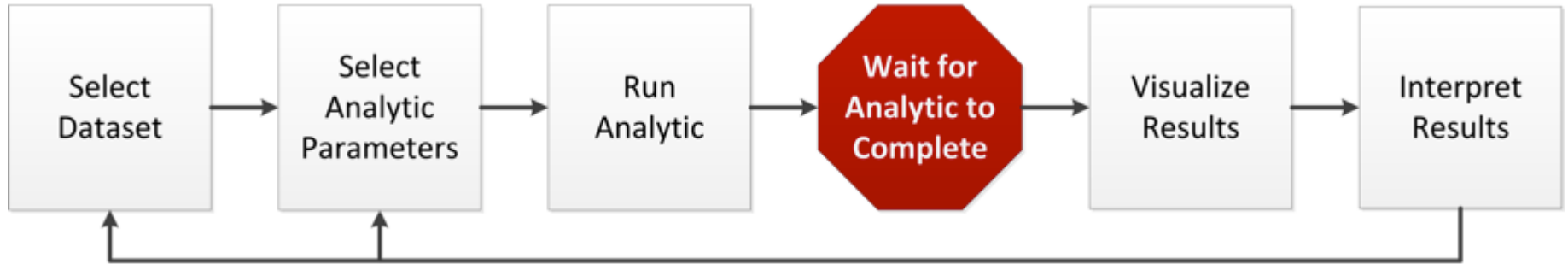
<https://www.flickr.com/photos/veggiefrog/3435380297/>

1. Increasingly large quantities of data
2. Increasingly complex analytics

*Not Getting Better*

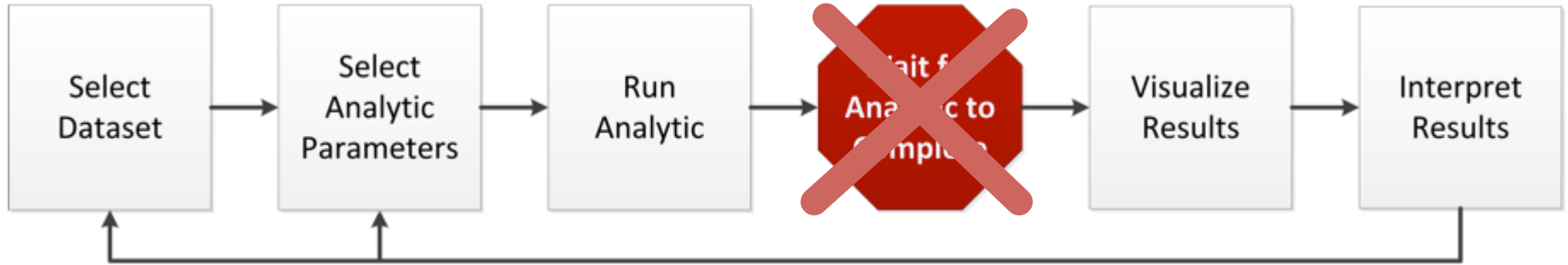
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# Batch Visual Analytics Workflow

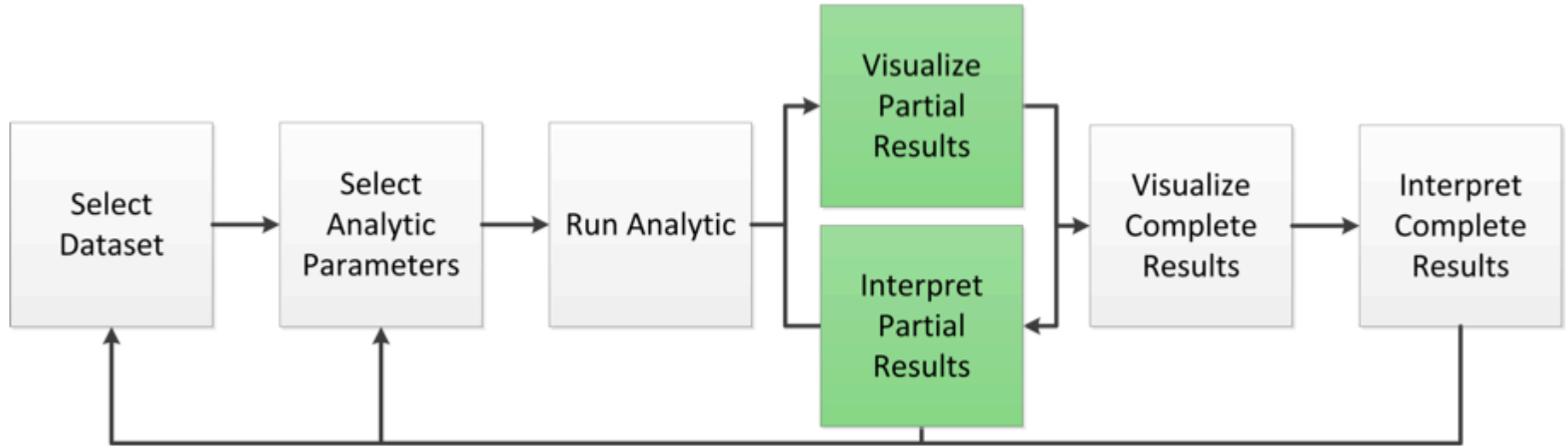




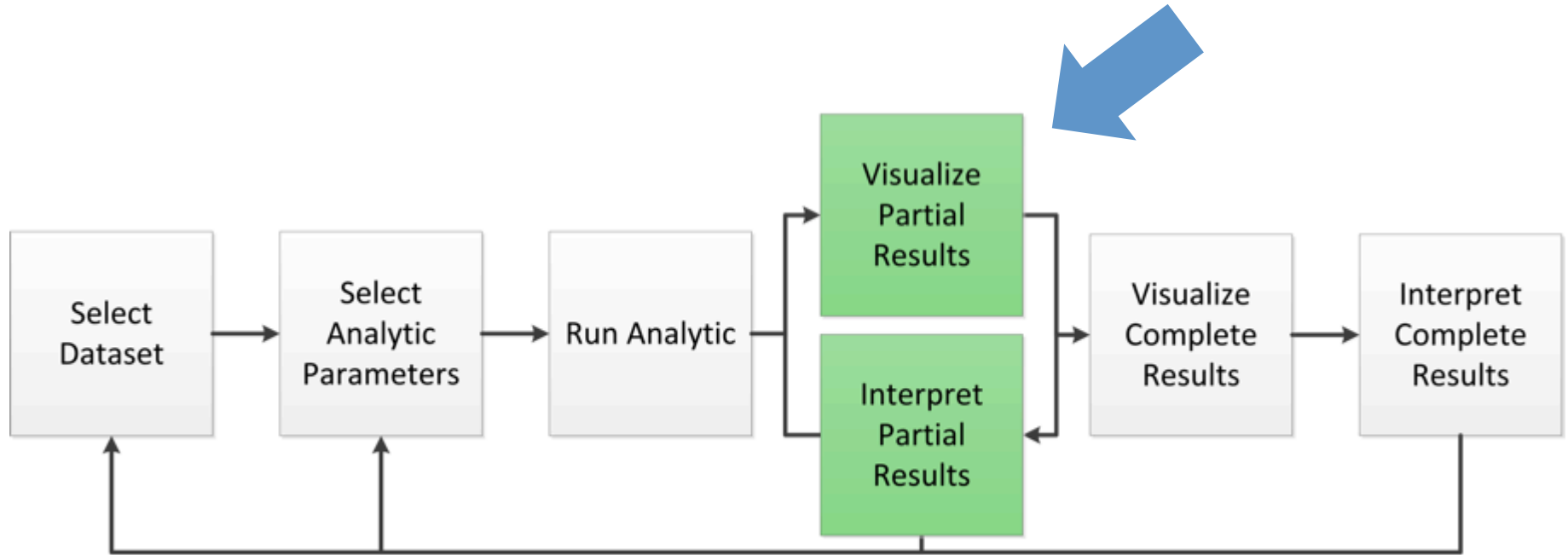
# Batch Visual Analytics Workflow



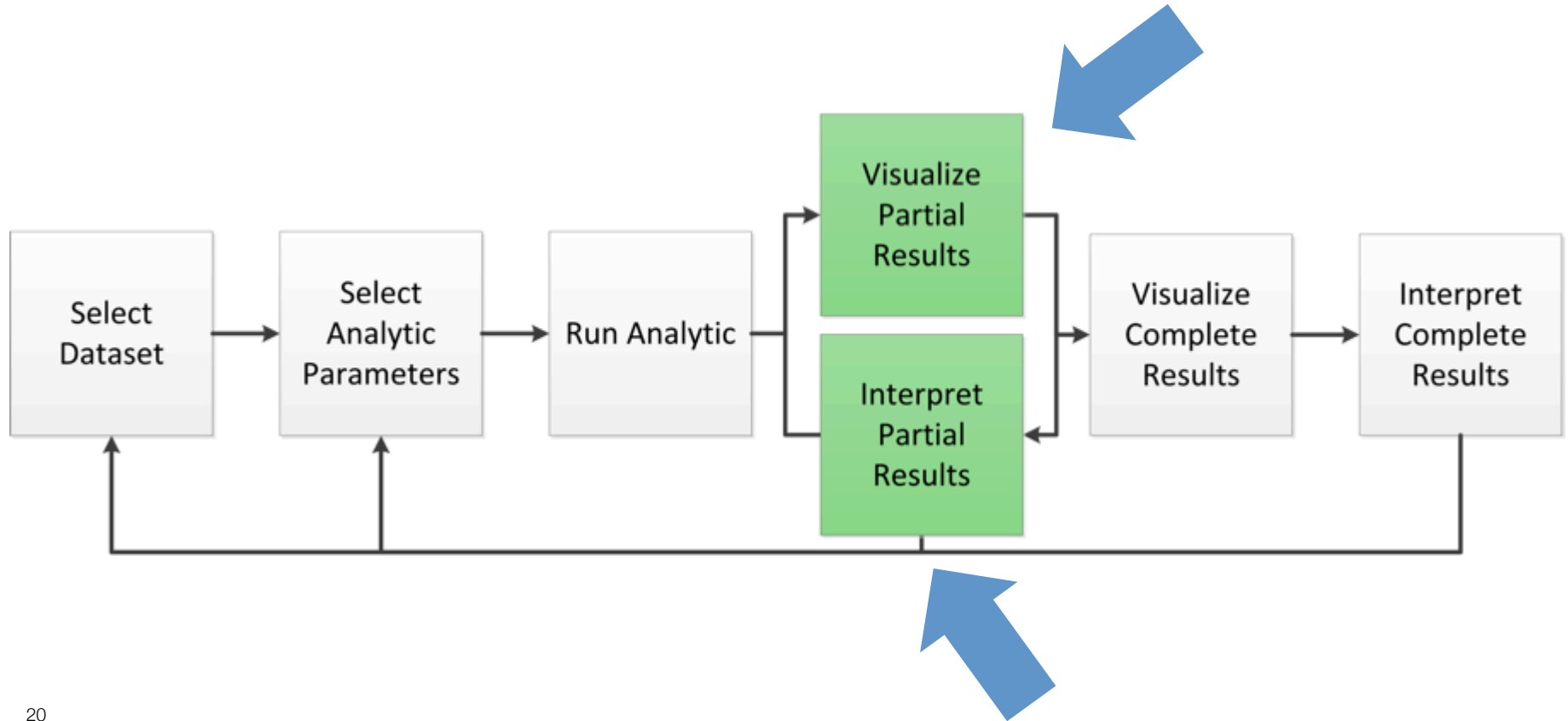
# Batch Visual Analytics Workflow



# Batch Visual Analytics Workflow

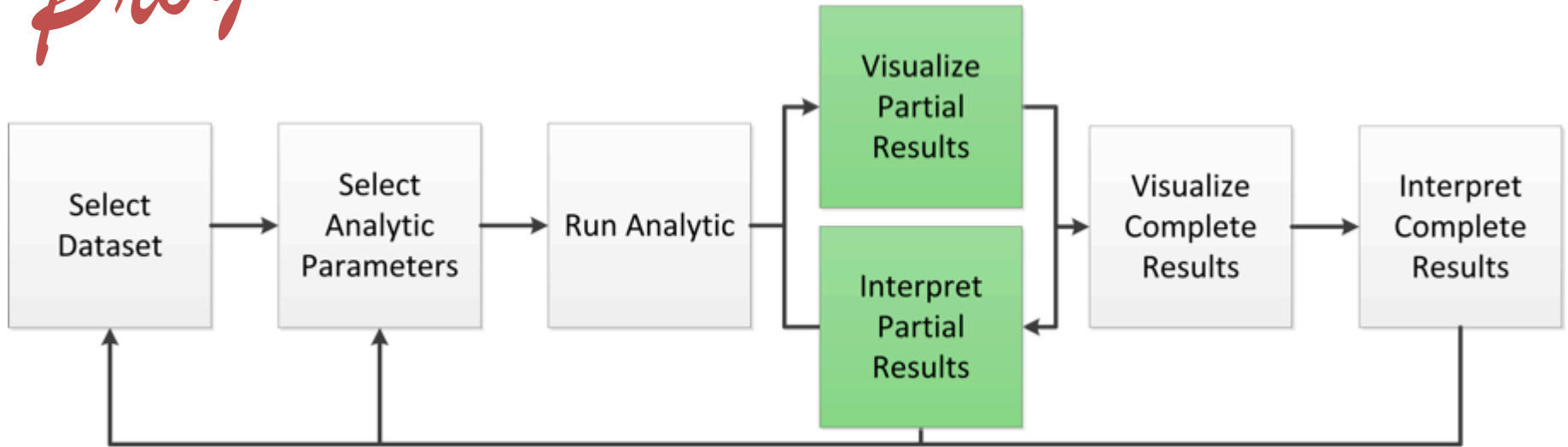


# Batch Visual Analytics Workflow



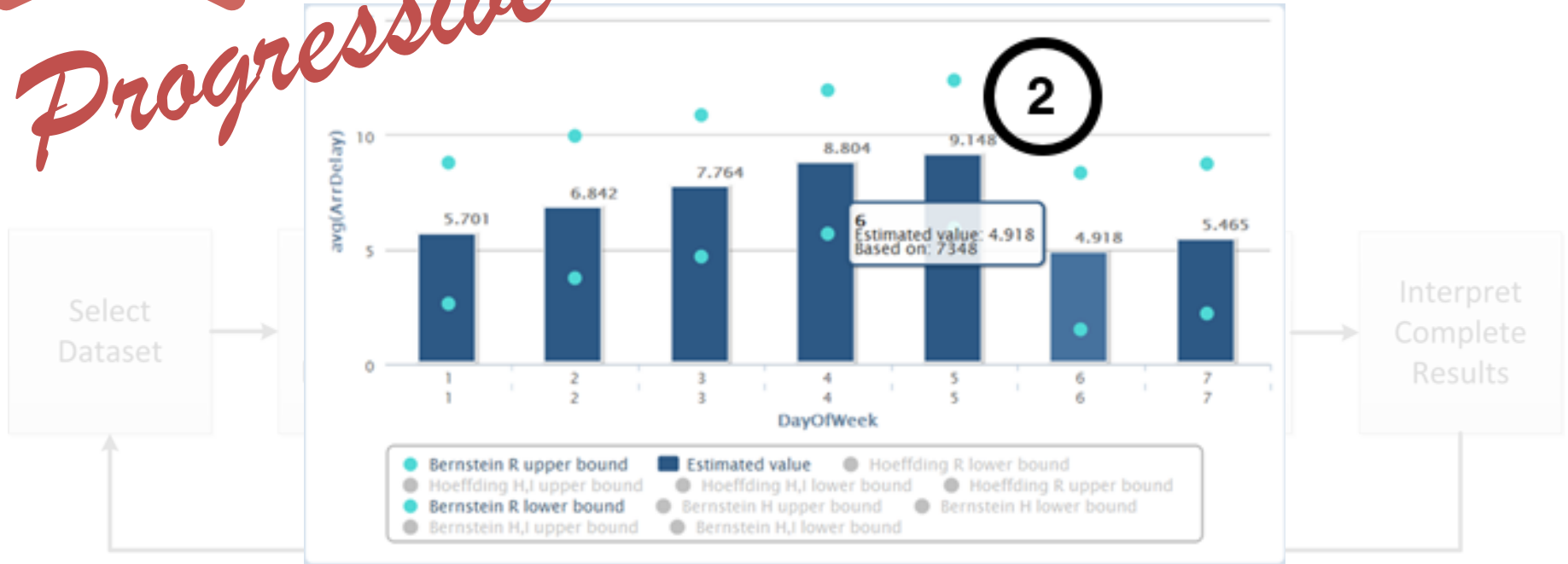
# ~~Batch~~ Visual Analytics Workflow

*Progressive*



# ~~Batch~~ Visual Analytics Workflow

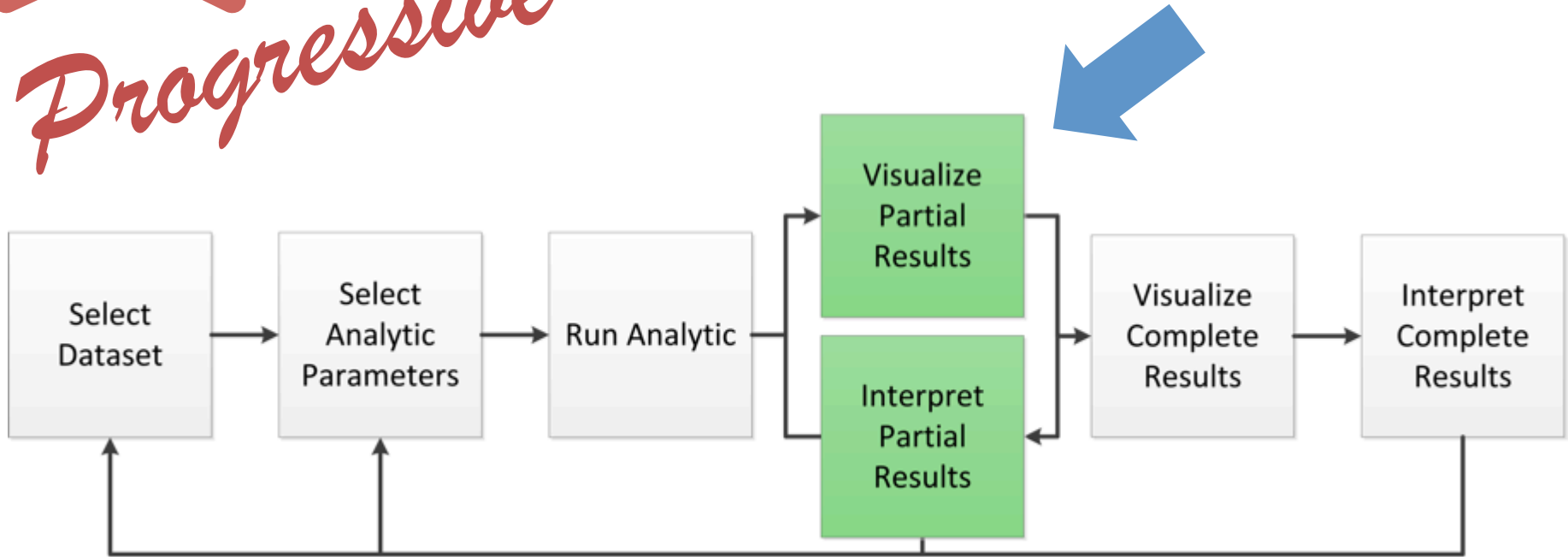
Progressive



D. Fisher, I. Popov, S. Drucker, and m. c. schraefel, "Trust me, i'm partially right: incremental visualization lets analysts explore large datasets faster," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, New York, NY, USA, 2012, pp. 1673–1682.

# ~~Batch~~ Visual Analytics Workflow

*Progressive*

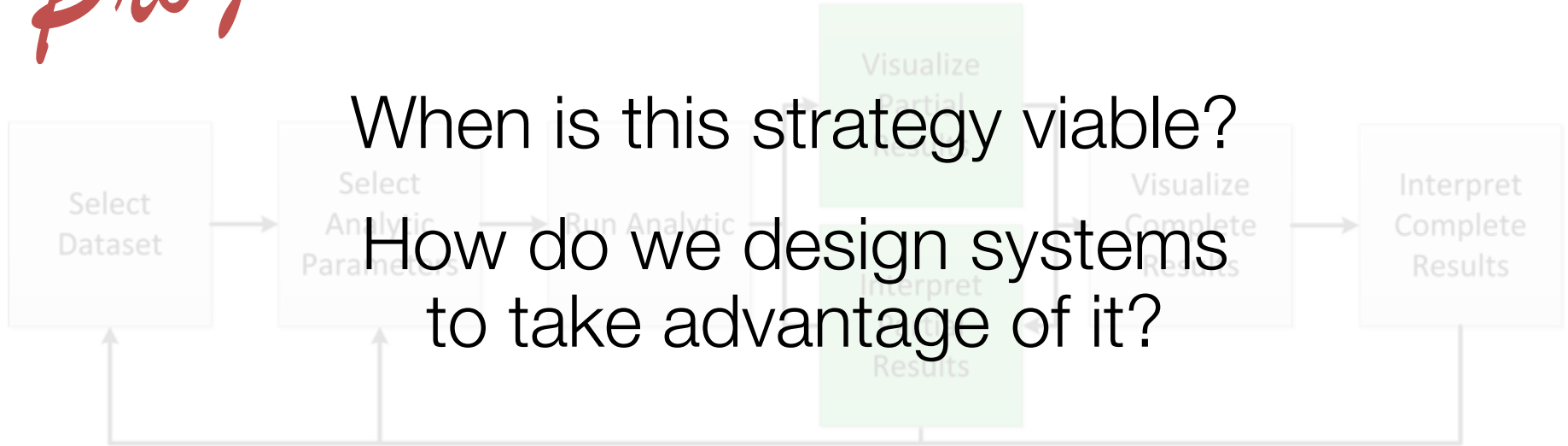


# ~~Batch~~ Visual Analytics Workflow

*Progressive*

When is this strategy viable?

How do we design systems  
to take advantage of it?





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# Progressive Visual Analytics

Progressive, User-Driven **Analytics**

Progressive, Interactive **Visualization**

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# Progressive Visual Analytics

Progressive, User-Driven **Analytics**

Progressive, Interactive **Visualization**

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# Progressive Analytics

Semantically-Meaningful Partial Results

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# Progressive Analytics

Semantically-Meaningful Partial Results  
(Thomas-- Results Feedback)

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# Progressive Analytics

Semantically-Meaningful  
Partial Results

The partial results  
are of the same form  
as the final results

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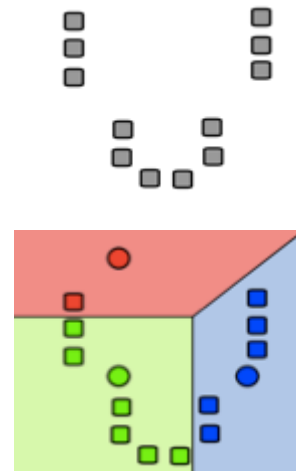
# Progressive Analytics



Semantically-Meaningful  
Partial Results

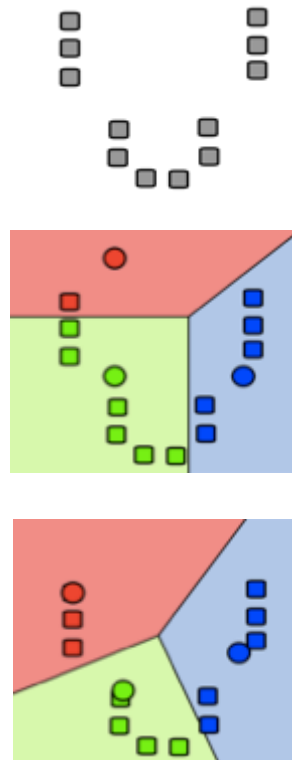
# Progressive Analytics

Semantically-Meaningful  
Partial Results



# Progressive Analytics

Semantically-Meaningful  
Partial Results





# Progressive Analytics

Semantically-Meaningful  
Partial Results



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# Progressive Analytics

Semantically-Meaningful  
Partial Results

K-Means

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# Progressive Analytics

Semantically-Meaningful  
Partial Results

K-Means

~~Logistic Regression~~

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# Progressive Visual Analytics

Progressive, User-Driven **Analytics**

Progressive, Interactive **Visualization**

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# User-Driven Analytics

Incorporate Analyst Knowledge

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# User-Driven Analytics

Incorporate Analyst  
Knowledge



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# User-Driven Analytics

Incorporate Analyst  
Knowledge

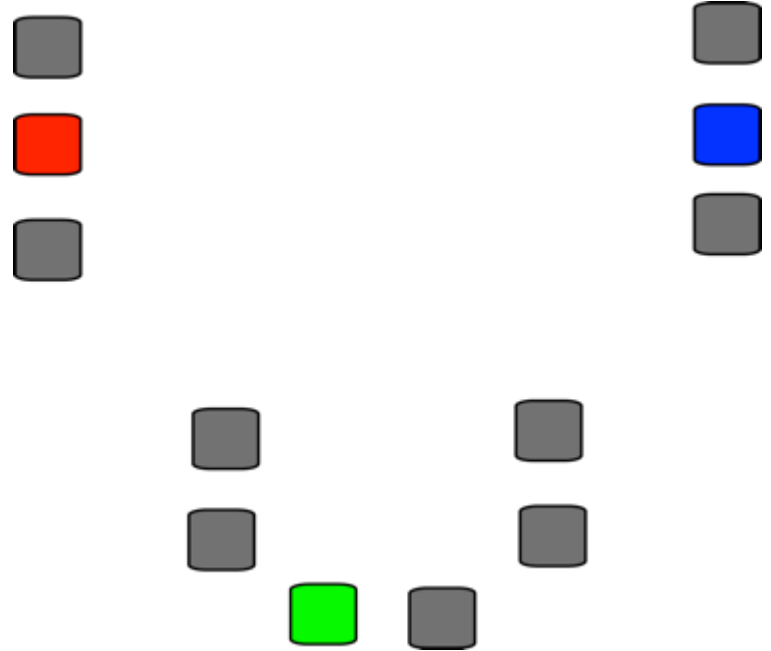


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# User-Driven Analytics

Incorporate Analyst  
Knowledge

(Thomas– Result Control)





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# Progressive Visual Analytics

Progressive, User-Driven **Analytics**

Progressive, Interactive **Visualization**

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# Progressive Visual Analytics

Progressive, User-Driven **Analytics**

Progressive, Interactive **Visualization**

---

# Progressive Visual Analytics

Progressive, User-Driven **Analytics**

Progressive, Interactive **Visualization**

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# Progressive Visualization

Visualize the Partial Results

---

# Progressive Visualization

Visualize the Partial Results  
(Thomas– Results Feedback)

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# Progressive Visualization

Analytic      Visualization      Analyst

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# Progressive Visualization

Up-to-Date  
Information

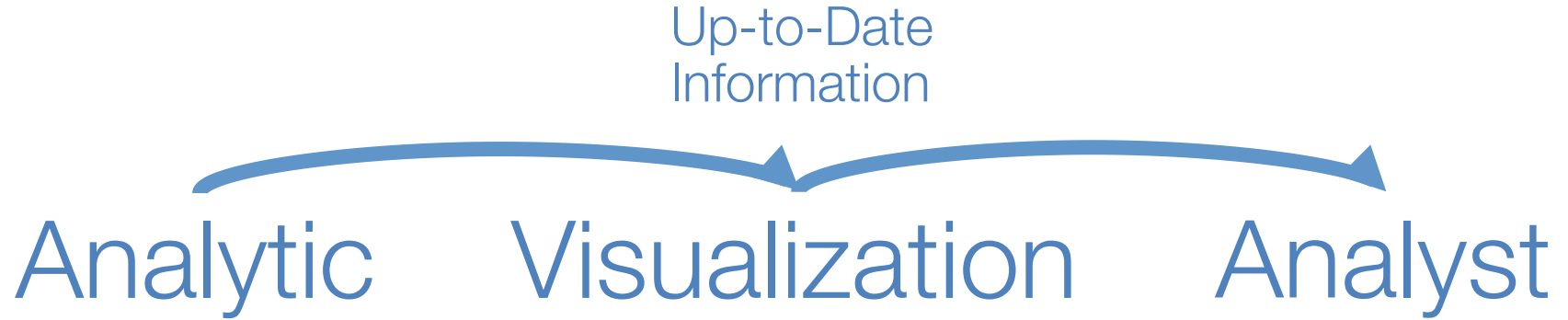
Analytic

Visualization

Analyst

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# Progressive Visualization





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# Progressive Visualization

Up-to-Date  
Information

Analytic Visualization Analyst

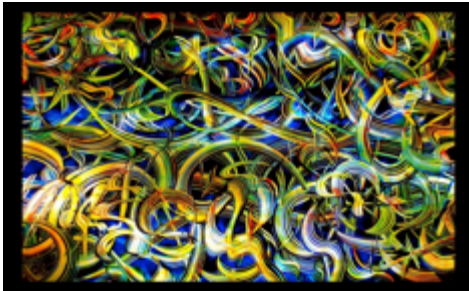


<http://info.jmu.edu/dux/files/2013/01/chaos.jpg>

# Progressive Visualization

Up-to-Date  
Information

Analytic Visualization Analyst



<http://info.jmu.edu/dux/files/2013/01/chaos.jpg>



<http://www.historyforkids.org/learn/medieval/history/byzantine/justinian.jpg>

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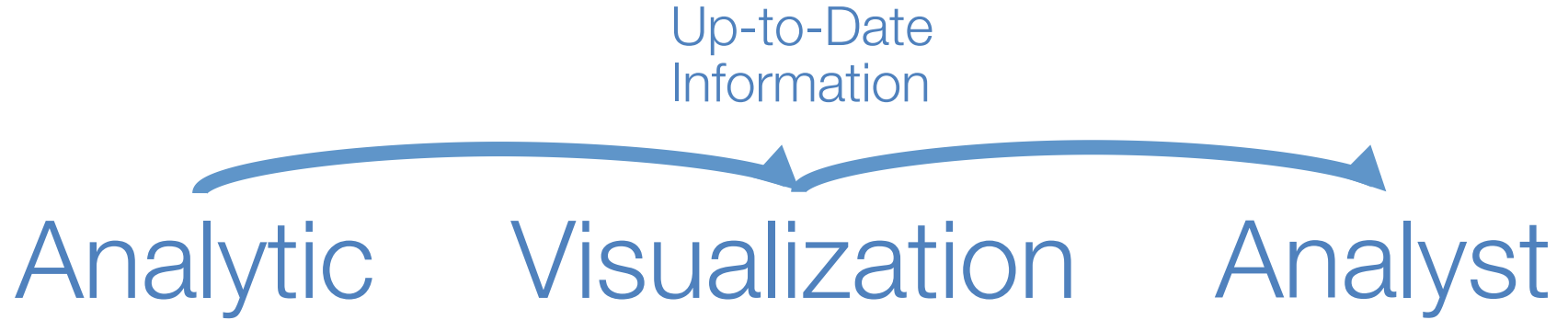
# Progressive Visual Analytics

Progressive, User-Driven **Analytics**

Progressive, Interactive **Visualization**

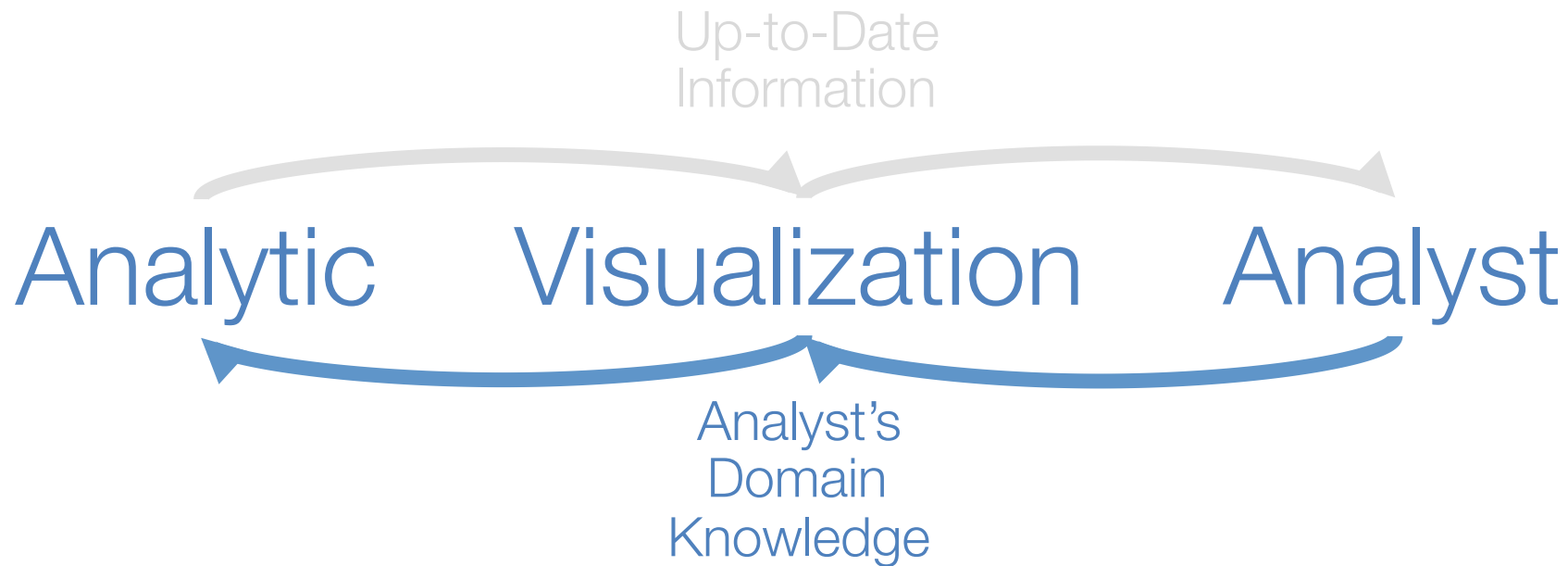
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# Progressive Visualization



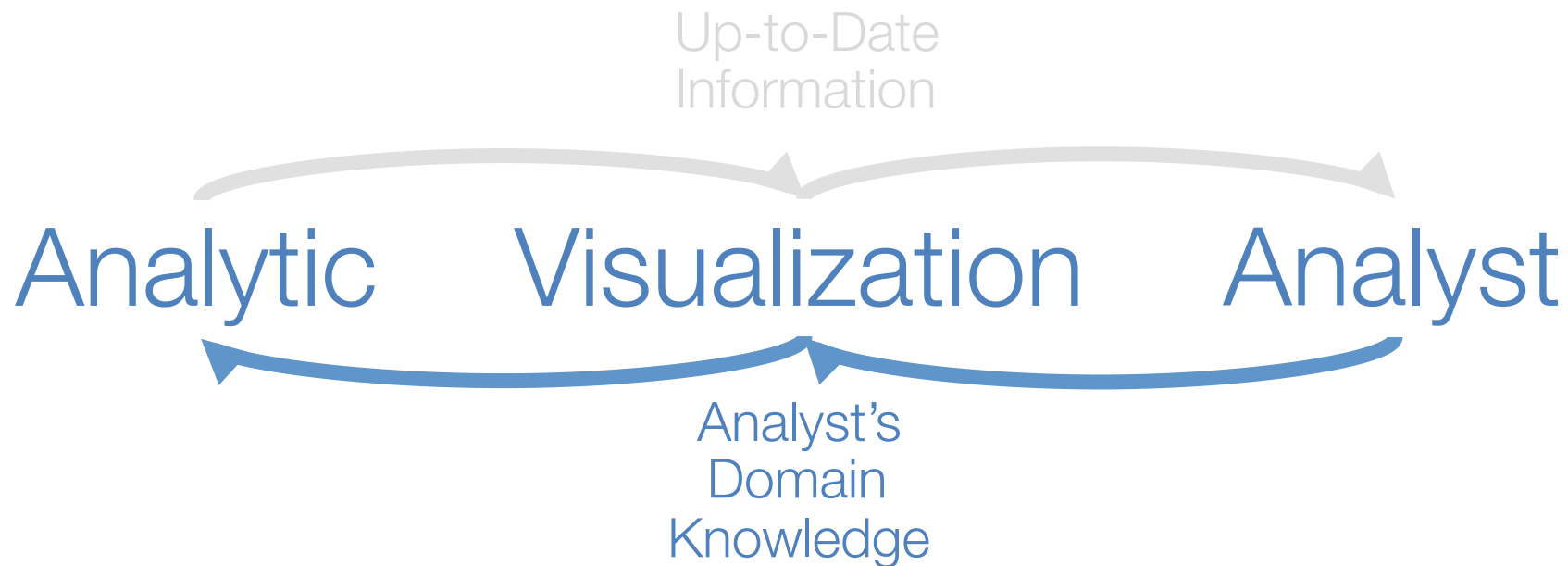
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# Interactive Visualization



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# Interactive Visualization



(Thomas– Execution Control)

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# Progressive Visual Analytics

Progressive, User-Driven **Analytics**

Progressive, Interactive **Visualization**

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So what might such a system look like?



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# Electronic Medical Records



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# Electronic Medical Records



Procedures

Lab Tests

Diagnoses

Medications

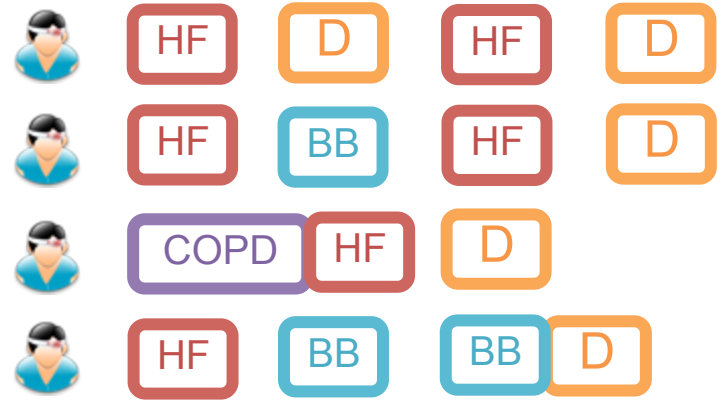
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# Electronic Medical Records



Event Series

# Electronic Medical Records



Event Series

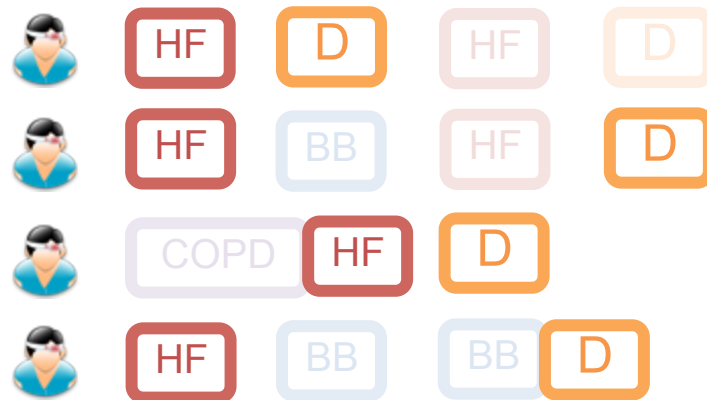
# Electronic Medical Records



Frequent Patterns

Event Series

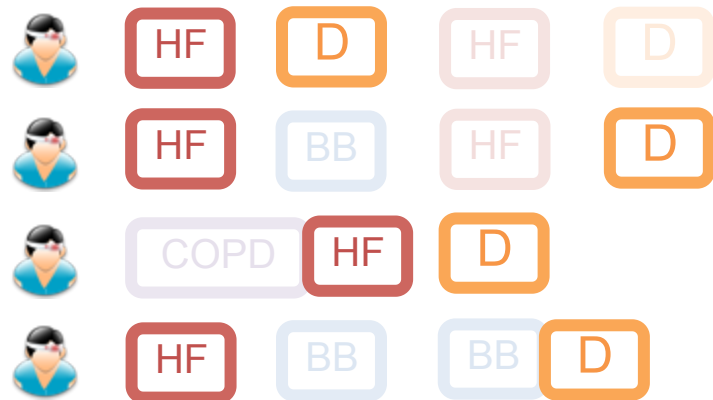
# Electronic Medical Records



Frequent Patterns

Event Series

# Electronic Medical Records



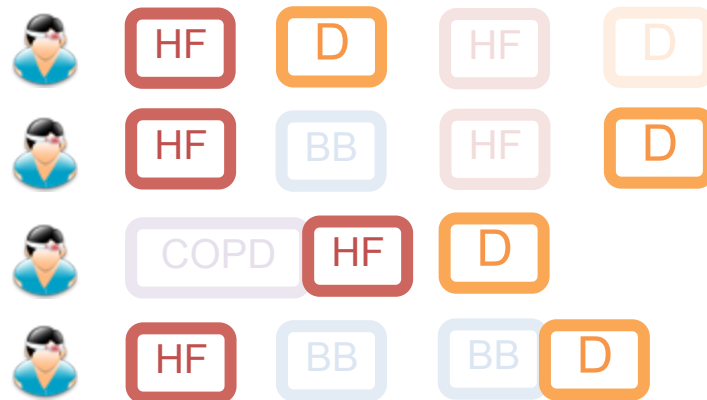
Frequent Patterns

Event Series

Correlate with Outcomes

# Electronic Medical Records

## What Works?



Frequent Patterns

Event Series

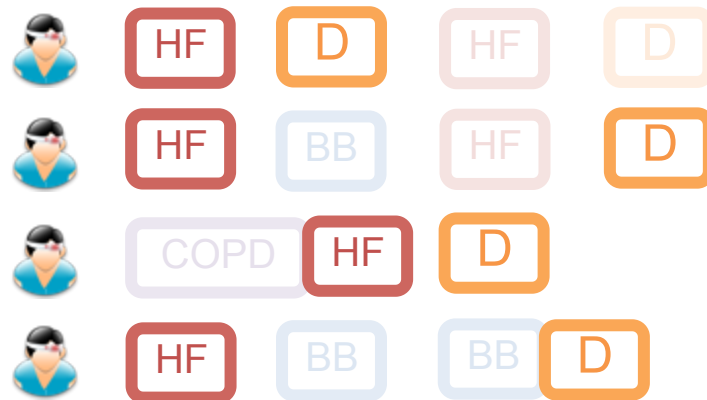
Correlate with Outcomes



# Electronic Medical Records

## What Works?

(What Doesn't Work?)



Frequent Patterns

Event Series

Correlate with Outcomes

---

# Sequential Pattern Mining Algorithm

J.Ayres, J.Flannick, J.Gehrke, and T.Yiu. Sequential Pattern mining using a bitmap representation. In *Proceedings of the eighth ACM SIGKDD international conference on Knowledge discovery and data mining*, KDD '02, pages 429–435, New York, NY, USA, 2002. ACM.

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# Sequential Pattern Mining Algorithm

(Thomas– Dependent Subdivision)

J.Ayres, J.Flannick, J.Gehrke, and T.Yiu. Sequential Pattern mining using a bitmap representation. In *Proceedings of the eighth ACM SIGKDD international conference on Knowledge discovery and data mining*, KDD '02, pages 429–435, New York, NY, USA, 2002. ACM.

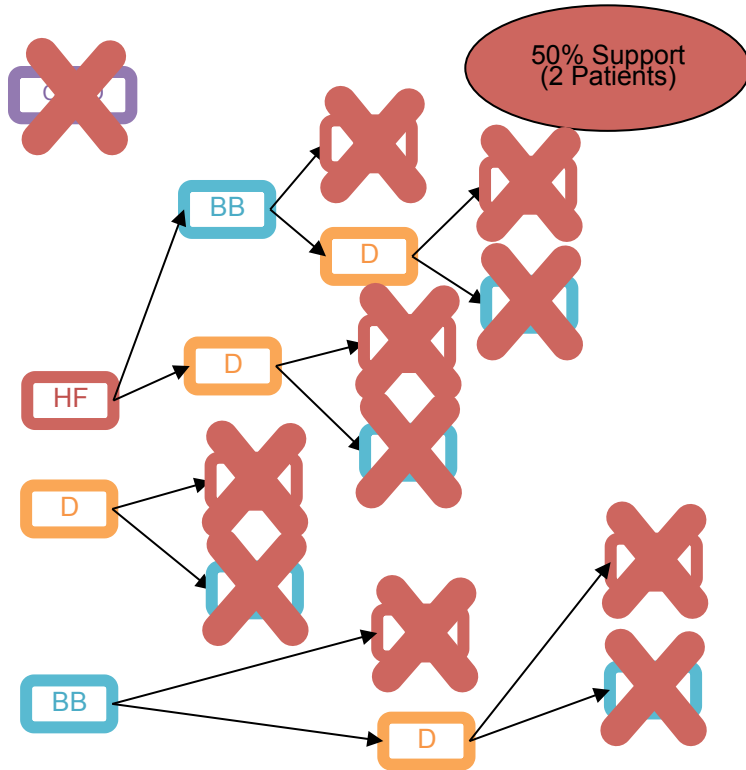
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# Sequential Pattern Mining Algorithm

- Build a tree of every possible pattern
  - (up to a maximum length)
- Prune the tree
  - (using a support threshold)



# Sequential Pattern Mining Algorithm



- Build a tree of every possible pattern
  - (up to a **maximum length**)
- Prune the tree
  - (using a support threshold)



---

# Sequential Pattern Mining Algorithm

Frequent Patterns

Event Series

Correlate with  
Outcomes

- Depth-First Search
- Outputs frequent patterns as each is found



---

# Sequential Pattern Mining Algorithm

Frequent Patterns

Event Series

Correlate with  
Outcomes

- Depth-First Search
- Outputs frequent patterns as each is found



---

# Sequential Pattern Mining Algorithm

Frequent Patterns

Event Series

Correlate with  
Outcomes

- Depth-First Search
- Outputs frequent patterns as each is found



---

# Interactive Sequential Pattern Mining

Frequent Patterns

Event Series

Correlate with  
Outcomes

- Breadth-First Search
- Outputs frequent patterns as each is found

---

# Interactive Sequential Pattern Mining

Frequent Patterns

Event Series

Correlate with  
Outcomes

- Breadth-First Search

- Outputs frequent patterns as each is found



---

# Interactive Sequential Pattern Mining

Frequent Patterns

Event Series

Correlate with  
Outcomes

- Breadth-First Search
  - Shorter patterns first
- Outputs frequent patterns as each is found



---

# Interactive Sequential Pattern Mining



<http://thenextweb.com/wp-content/blogs.dir/1/files/2013/02/queue.jpg>

- Breadth-First Search
  - Shorter patterns first
  
- Outputs frequent patterns as each is found

---

# Interactive Sequential Pattern Mining



<http://thenextweb.com/wp-content/blogs.dir/1/files/2013/02/queue.jpg>

- Breadth-First Search
  - Shorter patterns first
  - Analyst prioritization
- Outputs frequent patterns as each is found

---

# Interactive Sequential Pattern Mining



- Breadth-First Search
  - Shorter patterns first
  - Analyst prioritization
- Outputs frequent patterns as each is found



# Interactive Sequential Pattern Mining



- Breadth-First Search
  - Shorter patterns first
  - Analyst prioritization
- Outputs frequent patterns as each is found
- Manual Pruning

---

# Interactive Sequential Pattern Mining

COPD D

- Breadth-First Search
  - Shorter patterns first
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---

# Interactive Sequential Pattern Mining



- Breadth-First Search
  - Shorter patterns first
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- Outputs frequent patterns as each is found
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---

# Progressive Visual Analytics

Progressive, User-Driven **Analytics**

Progressive, Interactive **Visualization**

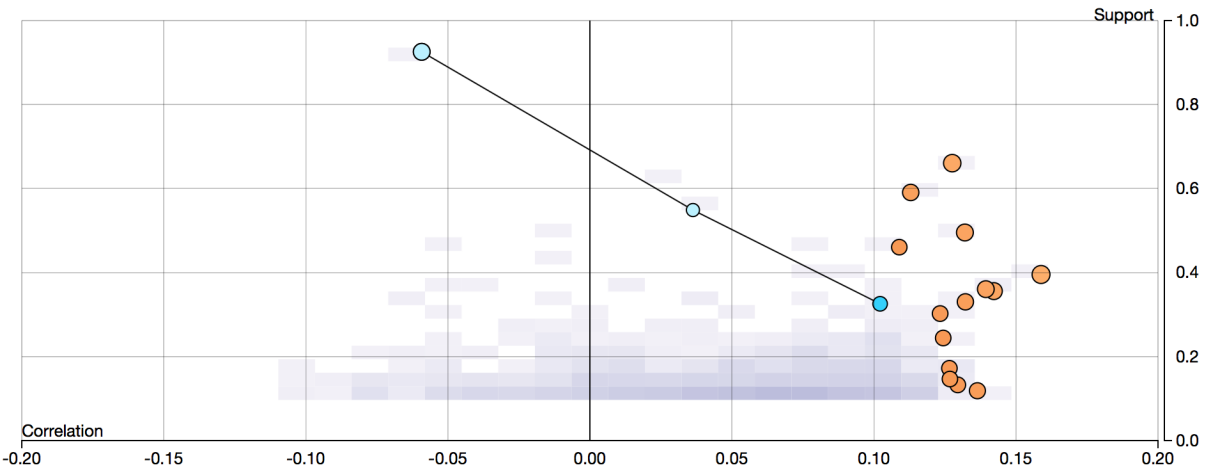
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# Progressive Visual Analytics

Progressive, User-Driven **Analytics**

Progressive, Interactive **Visualization**

Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path  | Extremes | List Histograms:  Real  Normalized



Support | [Correlation]

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

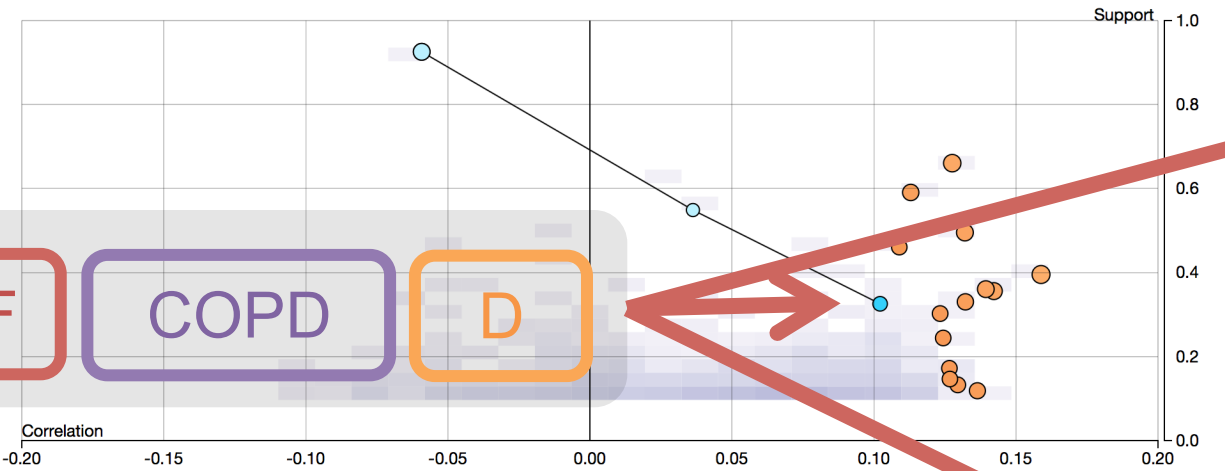
- heart failure
  - + ->diuretics3
  - ->chronic airways obstruction, not elsewh
  - + ->heart failure
  - + ->diuretics3
  - + ->glucocorticoids
  - + ->beta blockers2
  - + ->angiotensin-converting enzyme (ace
  - + ->no designated placement on usp mc
  - + ->bronchodilators, anticholinergic
  - + ->dyslipidemics, hmg coa reductase ir
  - + ->electrolyte/mineral replacement
  - + ->anti-inflammatories, inhaled corticos
  - >quinolones
  - >chronic bronchitis
  - >calcium channel blocking agents
  - >anticoagulants
- + ->beta blockers2
- + ->glucocorticoids
- + ->chronic airways obstruction, not elsewh
- + ->angiotensin-converting enzyme (ace) inf
- + ->no designated placement on usp model
- + ->electrolyte/mineral replacement
- + ->dyslipidemics, hmg coa reductase inhib
- + ->anti-inflammatories, inhaled corticoster
- + ->bronchodilators, anticholinergic
- + ->quinolones
- + ->anticoagulants
- + ->diuretics3
- + ->proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659  
 Pause and restart using only patients with this pattern

**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)  
 Pause and restart with new parameters Resume previous -- 2

Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path | Extremes | List Histograms: Real Normalized

Support



HF

COPD

D

- heart failure
- + => diuretics3
- => chronic airways obstruction, not elsewhere classified
- + => heart failure
- + => diuretics3
- + => glucocorticoids
- + => beta blockers2
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => bronchodilators, anticholinergic
- + => dyslipidemics, hmg coa reductase inhibitors
- + => electrolyte/mineral replacement
- + => anti-inflammatories, inhaled corticosteroids
- => quinolones
- => chronic bronchitis
- => calcium channel blocking agents
- => anticoagulants
- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere classified
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- + => anti-inflammatories, inhaled corticosteroids
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

Support

[Correlation]

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- diuretics3-->heart failure
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- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart f
- heart failure-->beta blockers2

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- diuretics3-->heart failure-->diuretics3
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- beta blockers2
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Selected Pattern: heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3

Support: 140 ( 32.56% )

Correlation: 0.1022

ΔCorrelation: 0.0659

Pause and restart using only patients with this pattern

Minimum Support Required: 43/430 ( 15% )

Level of Detail: 0 edit

Maximum Length: 6 edit

Positive Outcome Indicator: 1 edit

Pause and restart with new parameters

Minimum Support Required: 64/430 ( 15% )

Level of Detail: 0

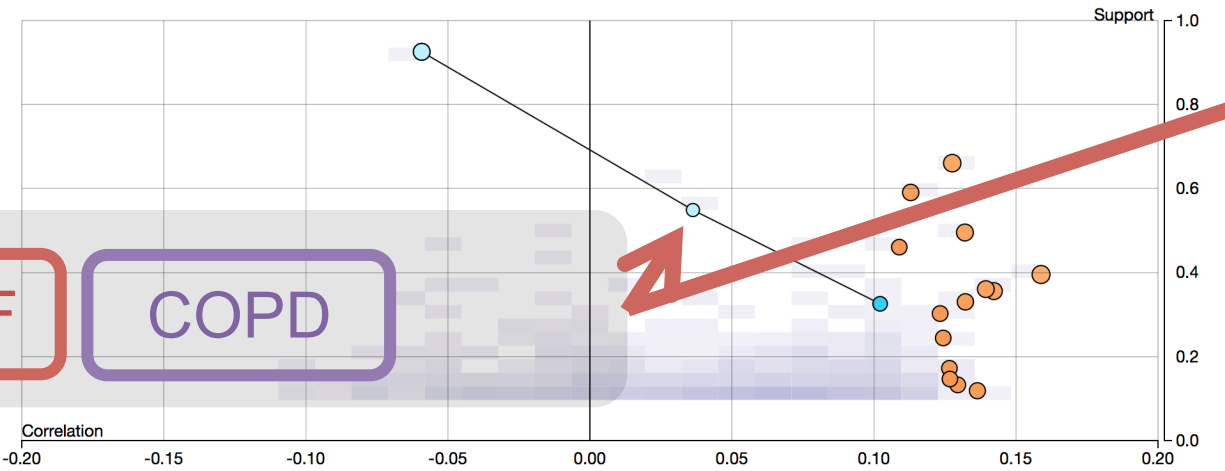
Maximum Length: 6

Positive Outcome Indicator: 1

Resume previous -- 2

Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path | Extremes | List Histograms: Real Normalized

Support



- heart failure
- + => diuretics3
- => chronic airways obstruction, not elsewhere classified
- + => heart failure
- + => diuretics3
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- + => beta blockers2
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- => calcium channel blocking agents
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- + => beta blockers2
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- + => anti-inflammatories, inhaled corticosteroids
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

Support

[Correlation]

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Minimum Support Required: 64/430 (15%)

Level of Detail: 0

Maximum Length: 6

Positive Outcome Indicator: 1

Pause and restart with new parameters

Resume previous -- 2

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3

**Support:** 140 (32.56%)

**Correlation:** 0.1022

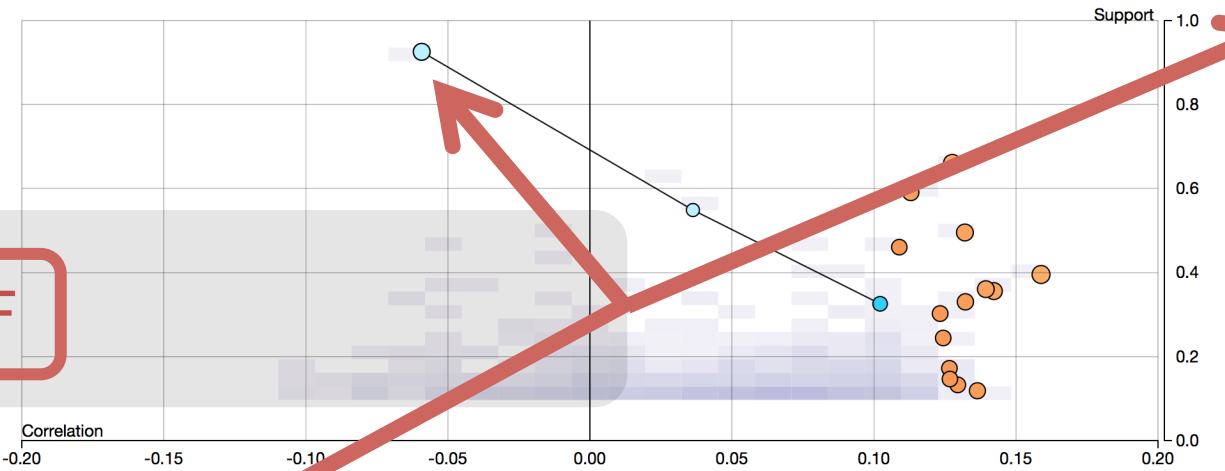
**ΔCorrelation:** 0.0659

Pause and restart using only patients with this pattern



Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path | Extremes | List Histograms: Real Normalized

Support



- heart failure
- + => diuretics3
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- + => glucocorticoids
- + => beta blockers2
- + => angiotensin-converting enzyme (ace) inhibitors
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- + => dyslipidemics, hmg coa reductase inhibitors
- + => electrolyte/mineral replacement
- + => anti-inflammatories, inhaled corticosteroids
- => quinolones
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- => anticoagulants
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- + => electrolyte/mineral replacement
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- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

Support

[Correlation]

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**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
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**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

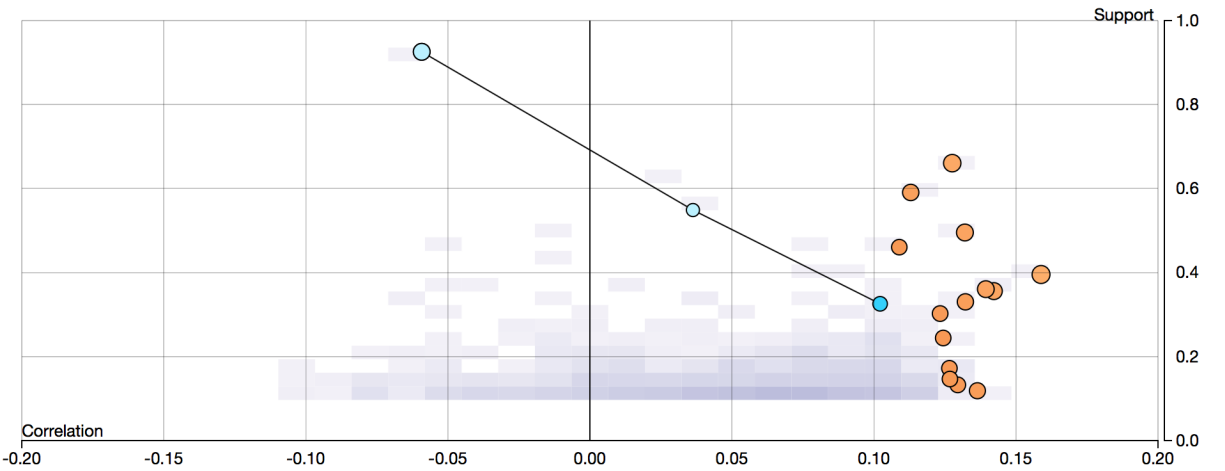
Pause and restart using only patients with this pattern

**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters

Resume previous -- 2

Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path  | Extremes | List Histograms:  Real  Normalized



Support | [Correlation]

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart
- heart failure-->beta blockers2

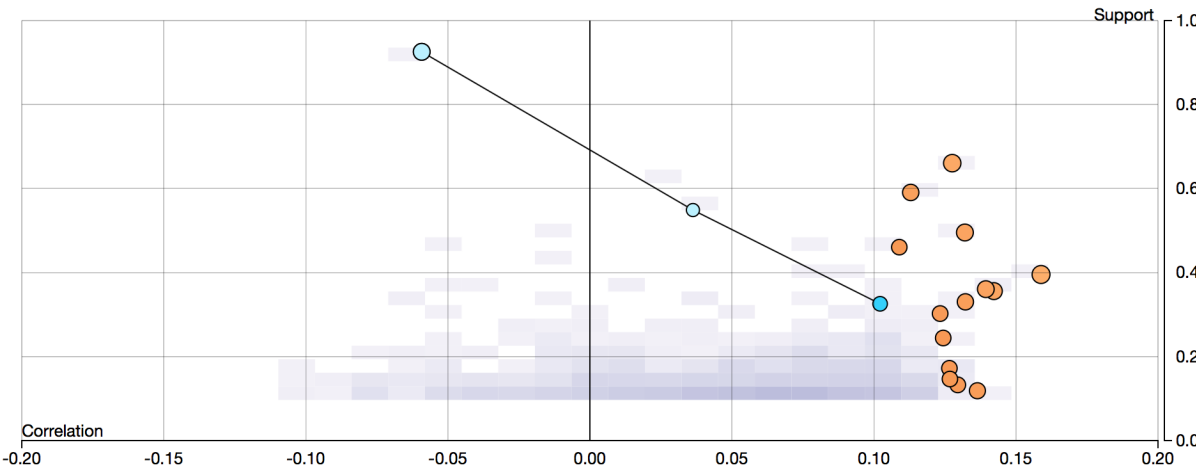
- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- heart failure
  - + -->diuretics3
  - -->chronic airways obstruction, not elsewh
  - + -->heart failure
  - + -->diuretics3
  - + -->glucocorticoids
  - + -->beta blockers2
  - + -->angiotensin-converting enzyme (ace
  - + -->no designated placement on usp mc
  - + -->bronchodilators, anticholinergic
  - + -->dyslipidemics, hmg coa reductase ir
  - + -->electrolyte/mineral replacement
  - + -->anti-inflammatories, inhaled corticos
  - quinolones
  - chronic bronchitis
  - calcium channel blocking agents
  - anticoagulants
  - beta blockers2
  - glucocorticoids
  - chronic airways obstruction, not elsewh
  - angiotensin-converting enzyme (ace) inf
  - no designated placement on usp model
  - electrolyte/mineral replacement
  - dyslipidemics, hmg coa reductase inhib
  - anti-inflammatories, inhaled corticoster
  - bronchodilators, anticholinergic
  - quinolones
  - anticoagulants
  - diuretics3
  - proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659  
 Pause and restart using only patients with this pattern

**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)  
 Pause and restart with new parameters Resume previous -- 2

Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path | Extremes | List Histograms: Real Normalized



- heart failure
- + => diuretics3
- => chronic airways obstruction, not elsewhere classified
- + => heart failure
- + => diuretics3
- + => glucocorticoids
- + => beta blockers2
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => bronchodilators, anticholinergic
- + => dyslipidemics, hmg coa reductase inhibitors
- + => electrolyte/mineral replacement
- + => anti-inflammatories, inhaled corticosteroids
- => quinolones
- => chronic bronchitis
- => calcium channel blocking agents
- => anticoagulants
- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere classified
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhibitors
- + => anti-inflammatories, inhaled corticosteroids
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

Support

|Correlation|

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart f
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere clas
- + => angiotensin-converting enzyme (ace) inh
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhib
- + => anti-inflammatories, inhaled corticosterc
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

Pause and restart using only patients with this pattern

**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters

Resume previous -- 2

Support

|Correlation|

heart failure

diuretics3

chronic airways obstruction, not elsewhere classified

heart failure-->diuretics3

heart failure-->chronic airways obstruction, not elsewhere clas

diuretics3-->heart failure

beta blockers2

glucocorticoids

chronic airways obstruction, not elsewhere classified-->heart t

heart failure-->beta blockers2

angiotensin-converting enzyme (ace) inhibitors

diuretics3-->heart failure-->diuretics3

heart failure-->angiotensin-converting enzyme (ace) inhibitors

diuretics3-->heart failure-->glucocorticoids-->diuretics3

dyslipidemics, hmg coa reductase inhibitors

beta blockers2

diuretics3-->heart failure-->diuretics3-->chronic airways obstr

diuretics3

dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co

diuretics3-->heart failure-->chronic airways obstruction, not el

Support

|Correlation|

heart failure

diuretics3

chronic airways obstruction, not elsewhere classified

heart failure-->diuretics3

heart failure-->chronic airways obstruction, not elsewhere clas

diuretics3-->heart failure

beta blockers2

glucocorticoids

chronic airways obstruction, not elsewhere classified-->heart t

heart failure-->beta blockers2

angiotensin-converting enzyme (ace) inhibitors

diuretics3-->heart failure-->diuretics3

heart failure-->angiotensin-converting enzyme (ace) inhibitors

diuretics3-->heart failure-->glucocorticoids-->diuretics3

dyslipidemics, hmg coa reductase inhibitors

beta blockers2

diuretics3-->heart failure-->diuretics3-->chronic airways obstr

diuretics3

dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co

diuretics3-->heart failure-->chronic airways obstruction, not el

Support

|Correlation|

heart failure

diuretics3

chronic airways obstruction, not elsewhere classified

heart failure-->diuretics3

heart failure-->chronic airways obstruction, not elsewhere clas

diuretics3-->heart failure

beta blockers2

glucocorticoids

chronic airways obstruction, not elsewhere classified-->heart t

heart failure-->beta blockers2



angiotensin-converting enzyme (ace) inhibitors

diuretics3-->heart failure-->diuretics3

heart failure-->angiotensin-converting enzyme (ace) inhibitors

diuretics3-->heart failure-->glucocorticoids-->diuretics3

dyslipidemics, hmg coa reductase inhibitors

beta blockers2

diuretics3-->heart failure-->diuretics3-->chronic airways obstr

diuretics3

dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co

diuretics3-->heart failure-->chronic airways obstruction, not el

Support

|Correlation|

heart failure

diuretics3

chronic airways obstruction, not elsewhere classified

heart failure-->diuretics3

heart failure-->chronic airways obstruction, not elsewhere clas

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glucocorticoids

chronic airways obstruction, not elsewhere classified-->heart t

heart failure-->beta blockers2

angiotensin-converting enzyme (ace) inhibitors

diuretics3-->heart failure-->diuretics3

heart failure-->angiotensin-converting enzyme (ace) inhibitors

diuretics3-->heart failure-->glucocorticoids-->diuretics3

dyslipidemics, hmg coa reductase inhibitors

beta blockers2

diuretics3-->heart failure-->diuretics3-->chronic airways obstr

diuretics3

dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co

diuretics3-->heart failure-->chronic airways obstruction, not el

Support

|Correlation|

heart failure

diuretics3

chronic airways obstruction, not elsewhere classified

heart failure-->diuretics3

heart failure-->chronic airways obstruction, not elsewhere clas

diuretics3-->heart failure

beta blockers2

glucocorticoids

chronic airways obstruction, not elsewhere classified-->heart t

heart failure-->beta blockers2

angiotensin-converting enzyme (ace) inhibitors

diuretics3-->heart failure-->diuretics3

heart failure-->angiotensin-converting enzyme (ace) inhibitors

diuretics3-->heart failure-->glucocorticoids-->diuretics3

dyslipidemics, hmg coa reductase inhibitors

beta blockers2

diuretics3-->heart failure-->diuretics3-->chronic airways obstr

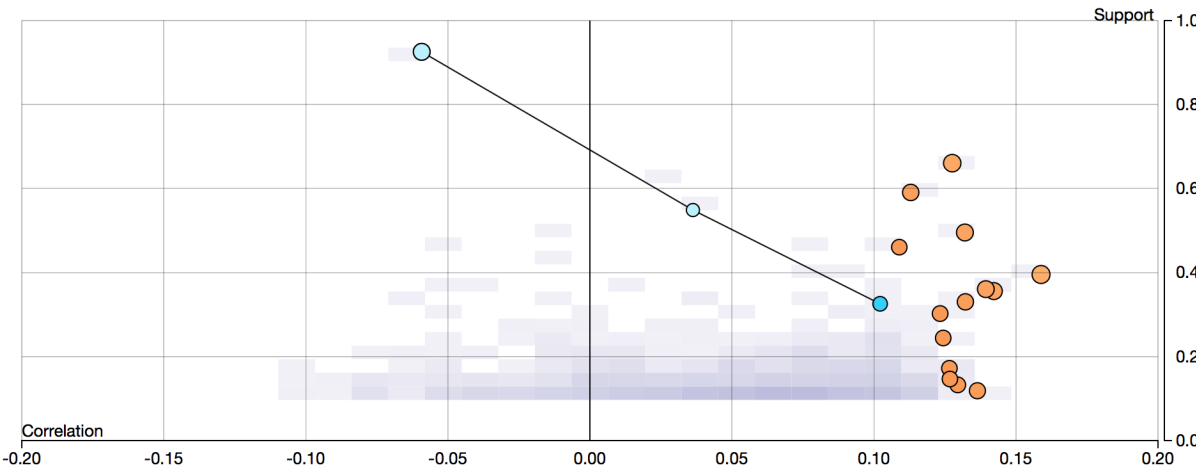
diuretics3

dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co

diuretics3-->heart failure-->chronic airways obstruction, not el



Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path | Extremes | List Histograms: Real Normalized



- heart failure
- + => diuretics3
- => chronic airways obstruction, not elsewhere classified
- + => heart failure
- + => diuretics3
- + => glucocorticoids
- + => beta blockers2
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => bronchodilators, anticholinergic
- + => dyslipidemics, hmg coa reductase inhibitors
- + => electrolyte/mineral replacement
- + => anti-inflammatories, inhaled corticosteroids
- => quinolones
- => chronic bronchitis
- => calcium channel blocking agents
- => anticoagulants
- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere classified
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhibitors
- + => anti-inflammatories, inhaled corticosteroids
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

Support

|Correlation|

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart f
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

Minimum Support Required: 64/430 (15%)  
 Level of Detail: 0  
 Maximum Length: 6  
 Positive Outcome Indicator: 1

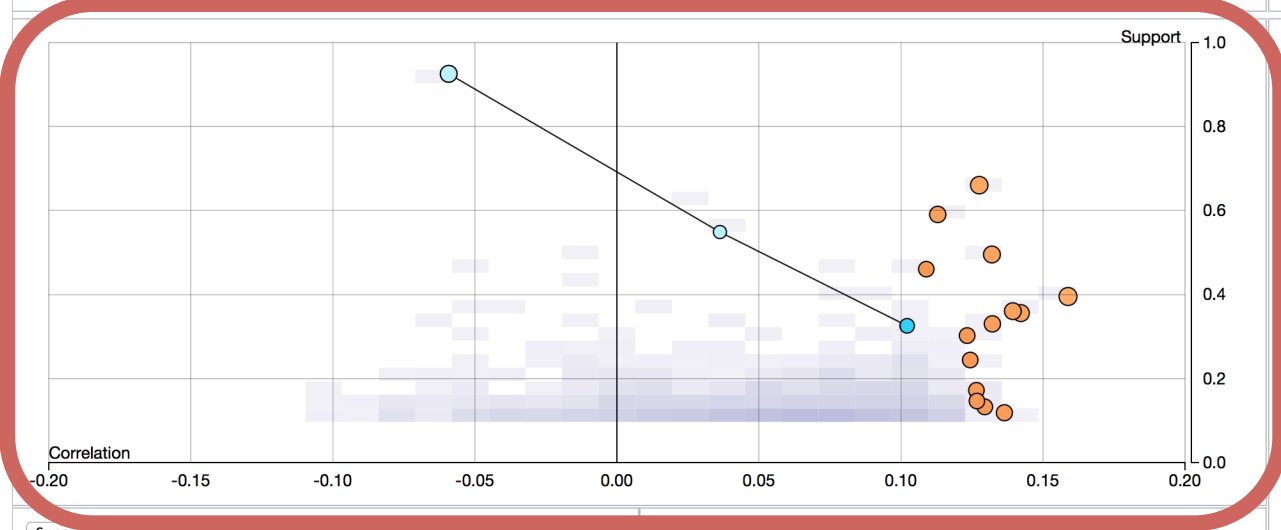
Pause and restart with new parameters | Resume previous -- 2

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

Pause and restart using only patients with this pattern

Refresh Clear Fit Show Lengths: 1 6 | Highlighted 15 | Show Path  Extremes List Histograms:  Real  Normalized

Support



- heart failure
- + => diuretics3
- => chronic airways obstruction, not elsewhere classified
- + => heart failure
- + => diuretics3
- + => glucocorticoids
- + => beta blockers2
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => bronchodilators, anticholinergic
- + => dyslipidemics, hmg coa reductase inhibitors
- + => electrolyte/mineral replacement
- + => anti-inflammatories, inhaled corticosteroids
- => quinolones
- => chronic bronchitis
- => calcium channel blocking agents
- => anticoagulants
- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere classified
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhibitors
- + => anti-inflammatories, inhaled corticosteroids
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

Support

[Correlation]

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart f
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere clas
- + => angiotensin-converting enzyme (ace) inh
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhib
- + => anti-inflammatories, inhaled corticosterc
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

Pause and restart using only patients with this pattern

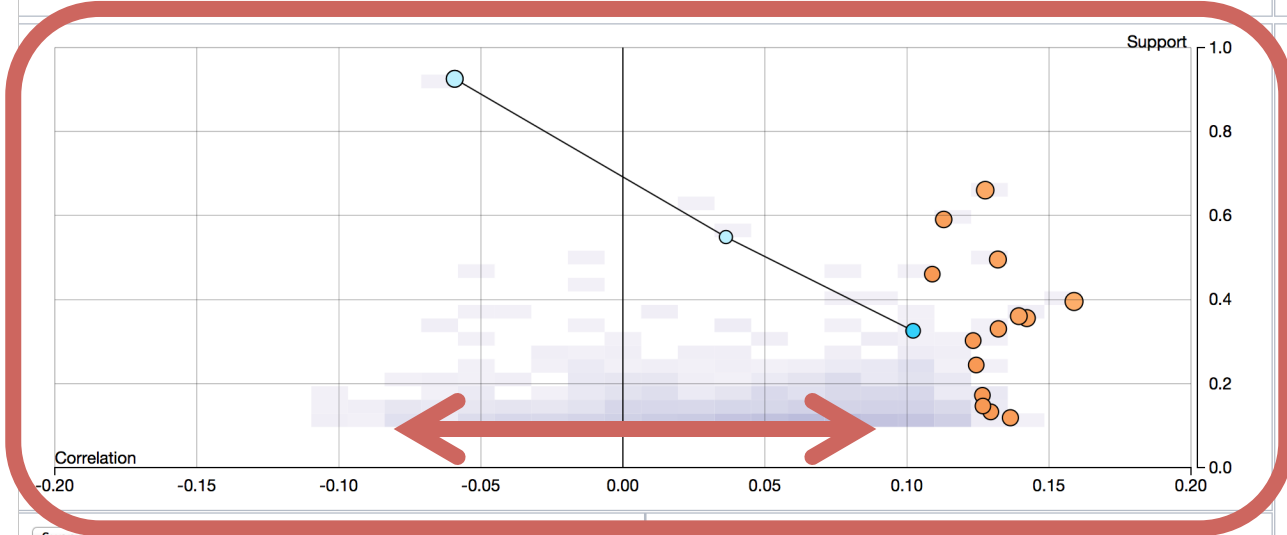
**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters

Resume previous -- 2

Refresh Clear Fit Show Lengths: 1 6 | Highlighted 15 | Show Path  Extremes List Histograms:  Real  Normalized

Support



- heart failure
- + => diuretics3
- => chronic airways obstruction, not elsewhere classified
- + => heart failure
- + => diuretics3
- + => glucocorticoids
- + => beta blockers2
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => bronchodilators, anticholinergic
- + => dyslipidemics, hmg coa reductase inhibitors
- + => electrolyte/mineral replacement
- + => anti-inflammatories, inhaled corticosteroids
- => quinolones
- => chronic bronchitis
- => calcium channel blocking agents
- => anticoagulants
- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere classified
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhibitors
- + => anti-inflammatories, inhaled corticosteroids
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

Support

|Correlation|

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart f
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere clas
- + => angiotensin-converting enzyme (ace) inh
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhib
- + => anti-inflammatories, inhaled corticosterc
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

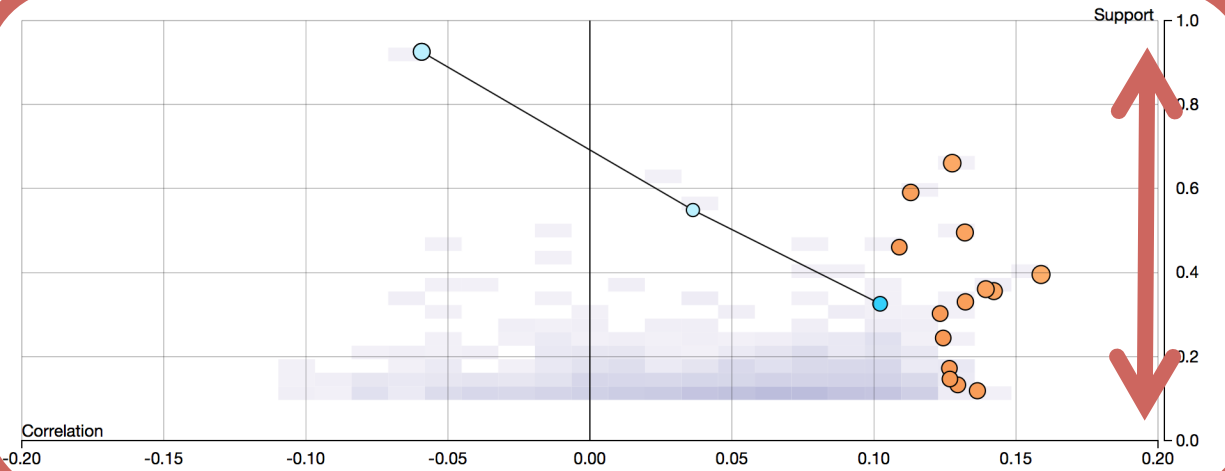
Pause and restart using only patients with this pattern

**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters

Resume previous -- 2

Refresh Clear Fit Show Lengths: 1 6 | Highlighted 15 | Show Path  Extremes List Histograms:  Real  Normalized



Support [dropdown] | [Correlation] [dropdown]

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

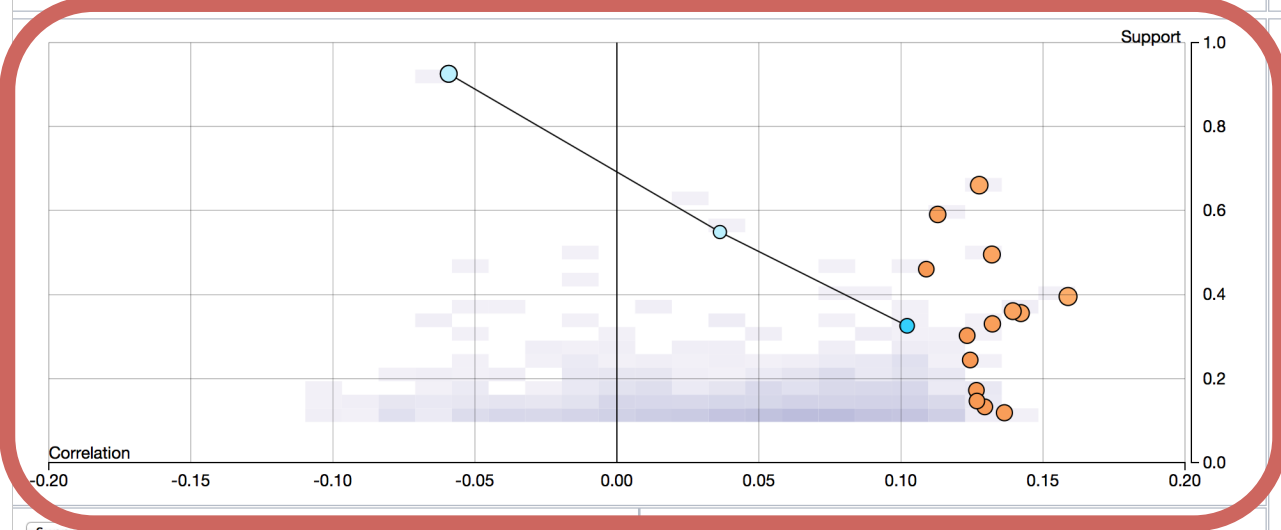
- heart failure
- +>diuretics3
- >chronic airways obstruction, not elsewh
- +>heart failure
- +>diuretics3
- +>glucocorticoids
- +>beta blockers2
- +>angiotensin-converting enzyme (ace
- +>no designated placement on usp mc
- +>bronchodilators, anticholinergic
- +>dyslipidemics, hmg coa reductase ir
- +>electrolyte/mineral replacement
- +>anti-inflammatories, inhaled corticos
- +>quinolones
- +>chronic bronchitis
- +>calcium channel blocking agents
- +>anticoagulants
- +>beta blockers2
- +>glucocorticoids
- +>chronic airways obstruction, not elsewh
- +>angiotensin-converting enzyme (ace) inf
- +>no designated placement on usp model
- +>electrolyte/mineral replacement
- +>dyslipidemics, hmg coa reductase inhib
- +>anti-inflammatories, inhaled corticoster
- +>bronchodilators, anticholinergic
- +>quinolones
- +>anticoagulants
- +>diuretics3
- +>proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659  
 Pause and restart using only patients with this pattern

**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)  
 Pause and restart with new parameters Resume previous -- 2

Refresh Clear Fit Show Lengths: 1 6 | Highlighted 15 | Show Path  Extremes List Histograms:  Real  Normalized

Support



- heart failure
- + => diuretics3
- => chronic airways obstruction, not elsewhere classified
- + => heart failure
- + => diuretics3
- + => glucocorticoids
- + => beta blockers2
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => bronchodilators, anticholinergic
- + => dyslipidemics, hmg coa reductase inhibitors
- + => electrolyte/mineral replacement
- + => anti-inflammatories, inhaled corticosteroids
- => quinolones
- => chronic bronchitis
- => calcium channel blocking agents
- => anticoagulants
- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere classified
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhibitors
- + => anti-inflammatories, inhaled corticosteroids
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

Support

[Correlation]

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart f
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere clas
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- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhib
- + => anti-inflammatories, inhaled corticosterc
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

Pause and restart using only patients with this pattern

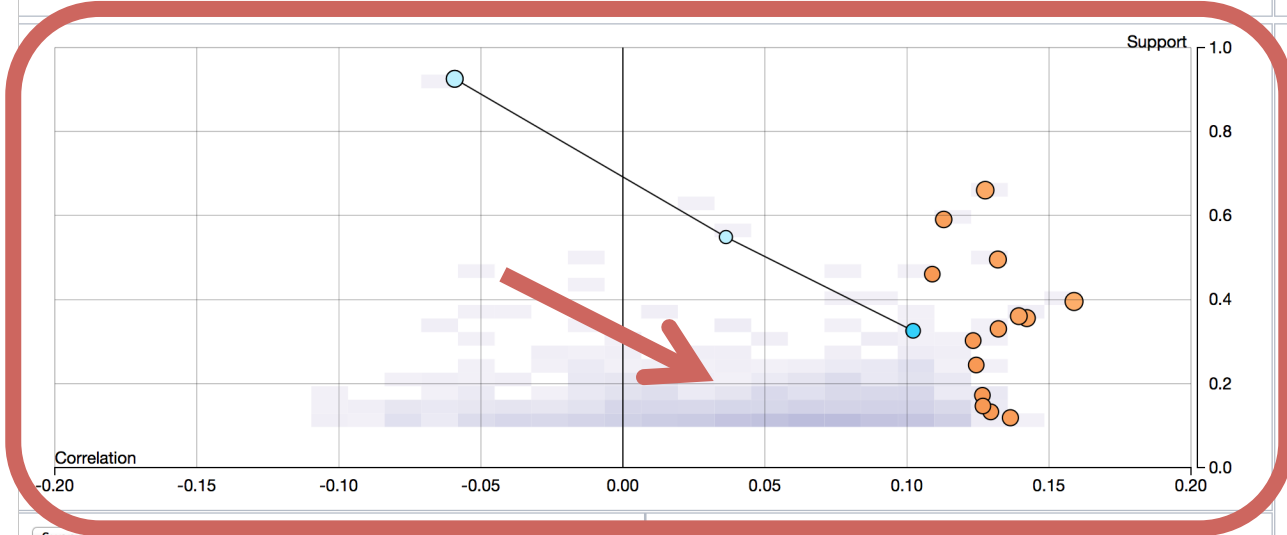
**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters

Resume previous -- 2

Refresh Clear Fit Show Lengths: 1 6 | Highlighted 15 | Show Path  Extremes List Histograms:  Real  Normalized

Support



- heart failure
- =>diuretics3
- =>chronic airways obstruction, not elsewhere
- =>heart failure
- =>diuretics3
- =>glucocorticoids
- =>beta blockers2
- =>angiotensin-converting enzyme (ace
- =>no designated placement on usp mc
- =>bronchodilators, anticholinergic
- =>dyslipidemics, hmg coa reductase in
- =>electrolyte/mineral replacement
- =>anti-inflammatories, inhaled corticos
- =>quinolones
- =>chronic bronchitis
- =>calcium channel blocking agents
- =>anticoagulants
- =>beta blockers2
- =>glucocorticoids
- =>chronic airways obstruction, not elsewhere
- =>angiotensin-converting enzyme (ace) inf
- =>no designated placement on usp model
- =>electrolyte/mineral replacement
- =>dyslipidemics, hmg coa reductase inhib
- =>anti-inflammatories, inhaled corticoster
- =>bronchodilators, anticholinergic
- =>quinolones
- =>anticoagulants
- =>diuretics3
- =>proton pump inhibitors

Support

[Correlation]

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- =>beta blockers2
- =>glucocorticoids
- =>chronic airways obstruction, not elsewhere
- =>angiotensin-converting enzyme (ace) inf
- =>no designated placement on usp model
- =>electrolyte/mineral replacement
- =>dyslipidemics, hmg coa reductase inhib
- =>anti-inflammatories, inhaled corticoster
- =>bronchodilators, anticholinergic
- =>quinolones
- =>anticoagulants
- =>diuretics3
- =>proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

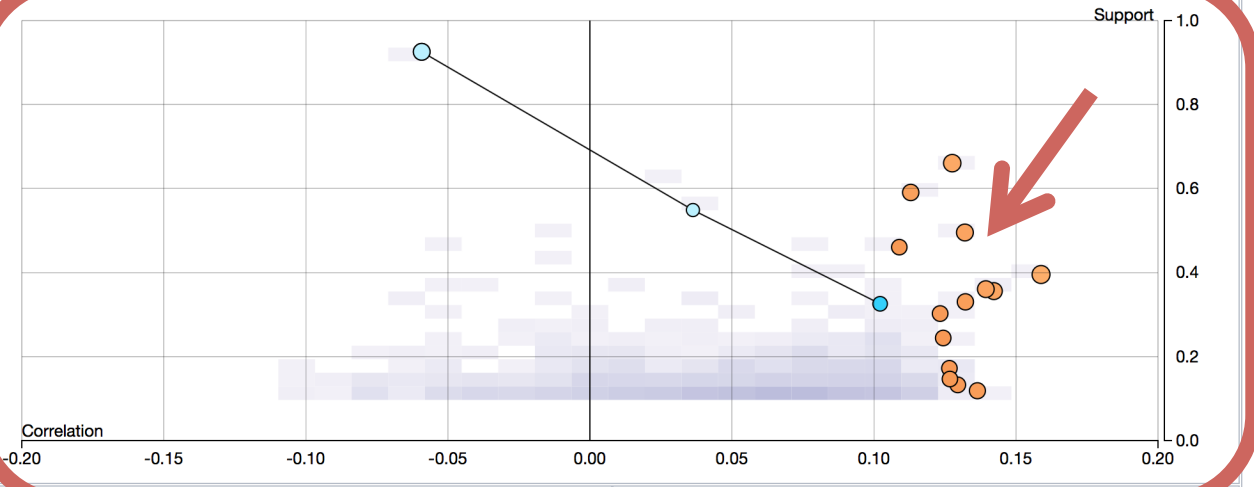
Pause and restart using only patients with this pattern

**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters

Resume previous -- 2

Refresh Clear Fit Show Lengths: 1 6 | Highlighted 15 | Show Path  Extremes List Histograms:  Real  Normalized



- heart failure
- + => diuretics3
- => chronic airways obstruction, not elsewhere classified
- + => heart failure
- + => diuretics3
- + => glucocorticoids
- + => beta blockers2
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => bronchodilators, anticholinergic
- + => dyslipidemics, hmg coa reductase inhibitors
- + => electrolyte/mineral replacement
- + => anti-inflammatories, inhaled corticosteroids
- => quinolones
- => chronic bronchitis
- => calcium channel blocking agents
- => anticoagulants
- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere classified
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhibitors
- + => anti-inflammatories, inhaled corticosteroids
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart f
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere clas
- + => angiotensin-converting enzyme (ace) inh
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhib
- + => anti-inflammatories, inhaled corticosterc
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

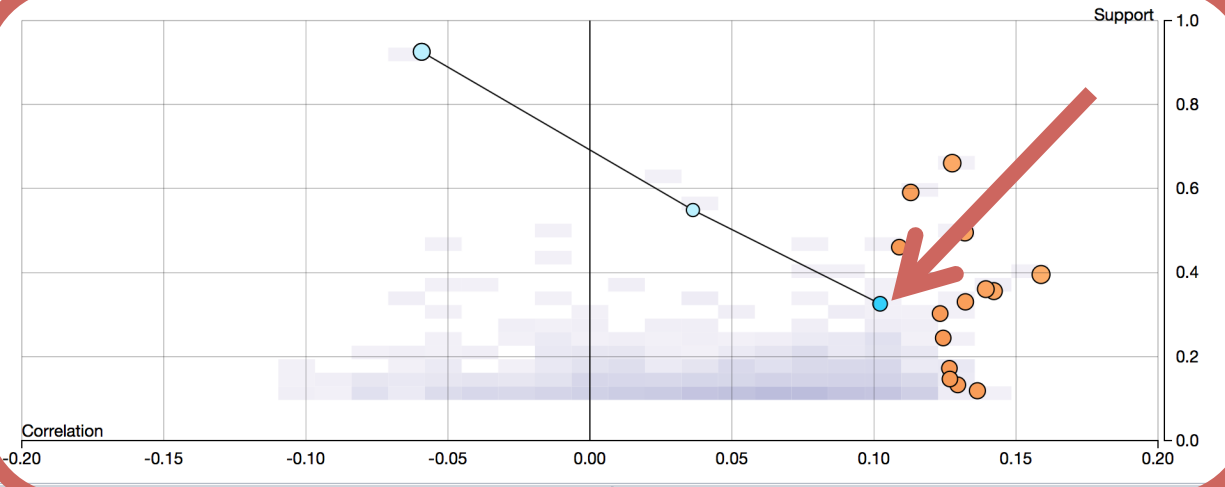
Pause and restart using only patients with this pattern

**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters

Resume previous -- 2

Refresh Clear Fit Show Lengths: 1 6 | Highlighted 15 | Show Path  Extremes List Histograms:  Real  Normalized



Support [dropdown] | [Correlation] [dropdown]

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- heart failure
- +>diuretics3
- >chronic airways obstruction, not elsewh
- +>heart failure
- +>diuretics3
- +>glucocorticoids
- +>beta blockers2
- +>angiotensin-converting enzyme (ace
- +>no designated placement on usp mc
- +>bronchodilators, anticholinergic
- +>dyslipidemics, hmg coa reductase ir
- +>electrolyte/mineral replacement
- +>anti-inflammatories, inhaled corticos
- +>quinolones
- +>chronic bronchitis
- +>calcium channel blocking agents
- +>anticoagulants
- +>beta blockers2
- +>glucocorticoids
- +>chronic airways obstruction, not elsewh
- +>angiotensin-converting enzyme (ace) inf
- +>no designated placement on usp model
- +>electrolyte/mineral replacement
- +>dyslipidemics, hmg coa reductase inhib
- +>anti-inflammatories, inhaled corticoster
- +>bronchodilators, anticholinergic
- +>quinolones
- +>anticoagulants
- +>diuretics3
- +>proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

Pause and restart using only patients with this pattern

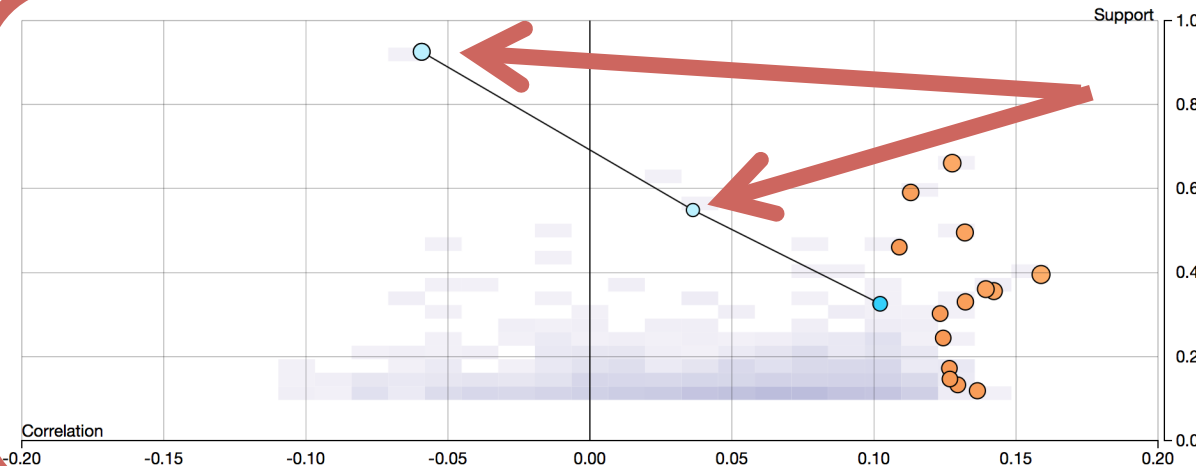
**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters

Resume previous -- 2



Refresh Clear Fit Show Lengths: 1 6 | Highlighted 15 | Show Path  Extremes List Histograms:  Real  Normalized



Support

[Correlation]

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- heart failure
- +>diuretics3
- >chronic airways obstruction, not elsewh
- +>heart failure
- +>diuretics3
- +>glucocorticoids
- +>beta blockers2
- +>angiotensin-converting enzyme (ace
- +>no designated placement on usp mc
- +>bronchodilators, anticholinergic
- +>dyslipidemics, hmg coa reductase ir
- +>electrolyte/mineral replacement
- +>anti-inflammatories, inhaled corticos
- +>quinolones
- +>chronic bronchitis
- +>calcium channel blocking agents
- +>anticoagulants
- +>beta blockers2
- +>glucocorticoids
- +>chronic airways obstruction, not elsewh
- +>angiotensin-converting enzyme (ace) inf
- +>no designated placement on usp model
- +>electrolyte/mineral replacement
- +>dyslipidemics, hmg coa reductase inhib
- +>anti-inflammatories, inhaled corticoster
- +>bronchodilators, anticholinergic
- +>quinolones
- +>anticoagulants
- +>diuretics3
- +>proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

Pause and restart using only patients with this pattern

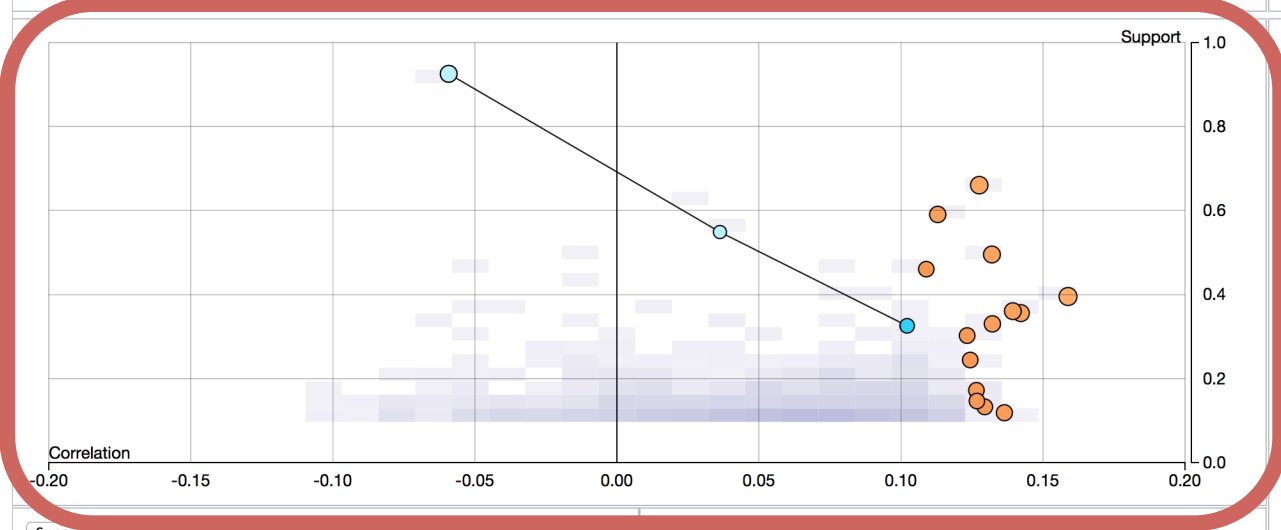
**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters

Resume previous -- 2

Refresh Clear Fit Show Lengths: 1 6 | Highlighted 15 | Show Path  Extremes List Histograms:  Real  Normalized

Support



- heart failure
- + => diuretics3
- => chronic airways obstruction, not elsewhere classified
- + => heart failure
- + => diuretics3
- + => glucocorticoids
- + => beta blockers2
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => bronchodilators, anticholinergic
- + => dyslipidemics, hmg coa reductase inhibitors
- + => electrolyte/mineral replacement
- + => anti-inflammatories, inhaled corticosteroids
- => quinolones
- => chronic bronchitis
- => calcium channel blocking agents
- => anticoagulants
- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere classified
- + => angiotensin-converting enzyme (ace) inhibitors
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhibitors
- + => anti-inflammatories, inhaled corticosteroids
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

Support

|Correlation|

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart f
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- + => beta blockers2
- + => glucocorticoids
- + => chronic airways obstruction, not elsewhere clas
- + => angiotensin-converting enzyme (ace) inh
- + => no designated placement on usp model
- + => electrolyte/mineral replacement
- + => dyslipidemics, hmg coa reductase inhib
- + => anti-inflammatories, inhaled corticosterc
- + => bronchodilators, anticholinergic
- + => quinolones
- + => anticoagulants
- + => diuretics3
- + => proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

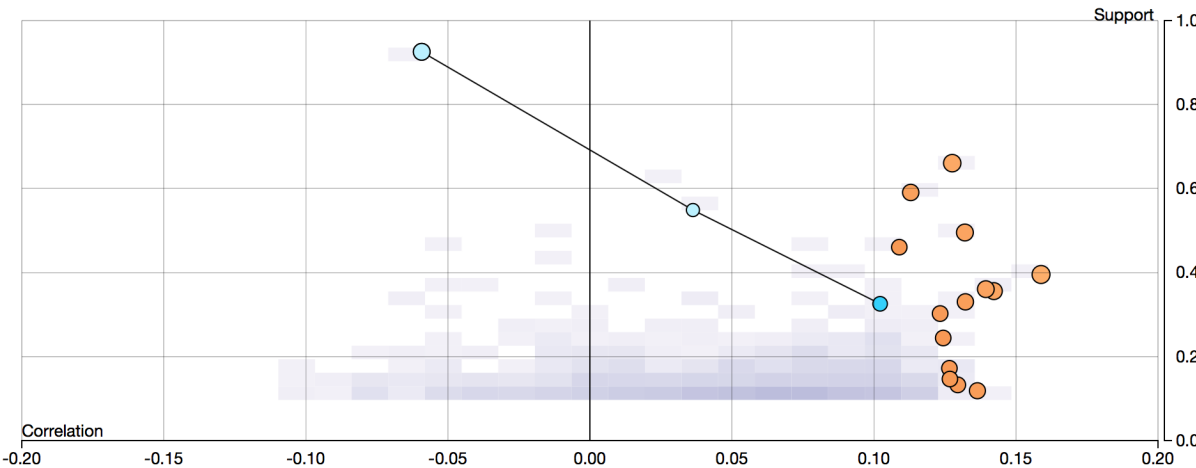
Pause and restart using only patients with this pattern

**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters

Resume previous -- 2

Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path | Extremes | List Histograms: Real Normalized



Support

[Correlation]

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

Support

- heart failure
  - + ->diuretics3
  - ->chronic airways obstruction, not elsewh
  - + ->heart failure
  - + ->diuretics3
  - + ->glucocorticoids
  - + ->beta blockers2
  - + ->angiotensin-converting enzyme (ace
  - + ->no designated placement on usp mc
  - + ->bronchodilators, anticholinergic
  - + ->dyslipidemics, hmg coa reductase ir
  - + ->electrolyte/mineral replacement
  - + ->anti-inflammatories, inhaled corticos
  - >quinolones
  - >chronic bronchitis
  - >calcium channel blocking agents
  - >anticoagulants
- + ->beta blockers2
- + ->glucocorticoids
- + ->chronic airways obstruction, not elsewh
- + ->angiotensin-converting enzyme (ace) inh
- + ->no designated placement on usp model
- + ->electrolyte/mineral replacement
- + ->dyslipidemics, hmg coa reductase inhib
- + ->anti-inflammatories, inhaled corticoster
- + ->bronchodilators, anticholinergic
- + ->quinolones
- + ->anticoagulants
- + ->diuretics3
- + ->proton pump inhibitors

Selected Pattern: heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3

Support: 140 ( 32.56% )

Correlation: 0.1022

ΔCorrelation: 0.0659

Pause and restart using only patients with this pattern

Minimum Support Required: 43/430

Level of Detail: 0

Maximum Length: 6

Positive Outcome Indicator: 1

Pause and restart with new parameters

Minimum Support Required: 64/430

Level of Detail: 0

Maximum Length: 6

Positive Outcome Indicator: 1

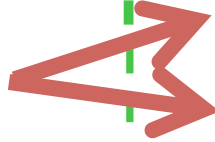
Resume previous -- 2

- - heart failure
  - (+) ⇒ diuretics3
  - - ⇒ chronic airways obstruction, not elsewhere
  - (+) ⇒ heart failure
  - (+) ⇒ diuretics3
  - (+) ⇒ glucocorticoids
  - (+) ⇒ beta blockers2
  - (+) ⇒ angiotensin-converting enzyme (ace)
  - (+) ⇒ no designated placement on usp mc
  - (+) ⇒ bronchodilators, anticholinergic
  - (+) ⇒ dyslipidemics, hmg coa reductase in
  - (+) ⇒ electrolyte/mineral replacement
  - (+) ⇒ anti-inflammatories, inhaled corticos
  - ( ) ⇒ quinolones
  - ( ) ⇒ chronic bronchitis
  - ( ) ⇒ calcium channel blocking agents
  - ( ) ⇒ anticoagulants
- (+) ⇒ beta blockers2
- (+) ⇒ glucocorticoids

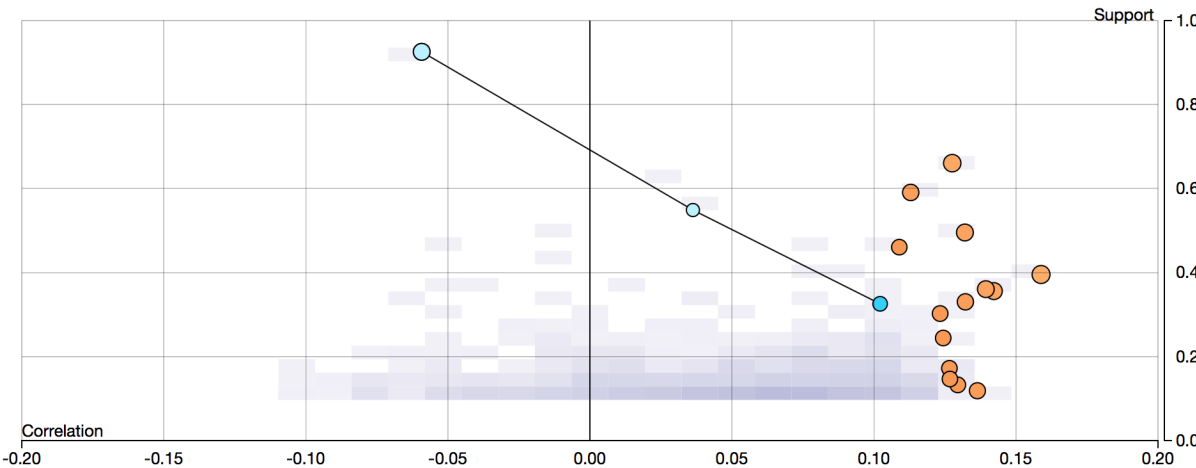
- heart failure
  - + ⇒ diuretics3
  - ⇒ chronic airways obstruction, not elsewhere
  - + ⇒ heart failure
  - + ⇒ diuretics3
  - + ⇒ glucocorticoids
  - + ⇒ beta blockers2
  - + ⇒ angiotensin-converting enzyme (ace)
  - + ⇒ no designated placement on usp mc
  - + ⇒ bronchodilators, anticholinergic
  - + ⇒ dyslipidemics, hmg coa reductase in
  - + ⇒ electrolyte/mineral replacement
  - + ⇒ anti-inflammatories, inhaled corticos
  - ⇒ quinolones
  - ⇒ chronic bronchitis
  - ⇒ calcium channel blocking agents
  - ⇒ anticoagulants
  - + ⇒ beta blockers2
  - + ⇒ glucocorticoids



- heart failure
  - ⇒ diuretics3
  - ⇒ chronic airways obstruction, not elsewhere
  - ⇒ heart failure
  - ⇒ diuretics3
  - ⇒ glucocorticoids
  - ⇒ beta blockers2
  - ⇒ angiotensin-converting enzyme (ace)
  - ⇒ no designated placement on usp mc
  - ⇒ bronchodilators, anticholinergic
  - ⇒ dyslipidemics, hmg coa reductase in
  - ⇒ electrolyte/mineral replacement
  - ⇒ anti-inflammatories, inhaled corticos
  - ⇒ quinolones
  - ⇒ chronic bronchitis
  - ⇒ calcium channel blocking agents
  - ⇒ anticoagulants
- ⇒ beta blockers2
- ⇒ glucocorticoids



Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path | Extremes | List Histograms: Real Normalized



Support

|Correlation|

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

Support

- heart failure
  - + ->diuretics3
  - ->chronic airways obstruction, not elsewh
  - + ->heart failure
  - + ->diuretics3
  - + ->glucocorticoids
  - + ->beta blockers2
  - + ->angiotensin-converting enzyme (ace
  - + ->no designated placement on usp mc
  - + ->bronchodilators, anticholinergic
  - + ->dyslipidemics, hmg coa reductase ir
  - + ->electrolyte/mineral replacement
  - + ->anti-inflammatories, inhaled corticos
  - >quinolones
  - >chronic bronchitis
  - >calcium channel blocking agents
  - >anticoagulants
- + ->beta blockers2
- + ->glucocorticoids
- + ->chronic airways obstruction, not elsewh
- + ->angiotensin-converting enzyme (ace) inh
- + ->no designated placement on usp model
- + ->electrolyte/mineral replacement
- + ->dyslipidemics, hmg coa reductase inhib
- + ->anti-inflammatories, inhaled corticoster
- + ->bronchodilators, anticholinergic
- + ->quinolones
- + ->anticoagulants
- + ->diuretics3
- + ->proton pump inhibitors

Selected Pattern: heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3

Support: 140 ( 32.56% )

Correlation: 0.1022

ΔCorrelation: 0.0659

Pause and restart using only patients with this pattern

Minimum Support Required: 43/430

Level of Detail: 0

Maximum Length: 6

Positive Outcome Indicator: 1

Pause and restart with new parameters

Minimum Support Required: 64/430

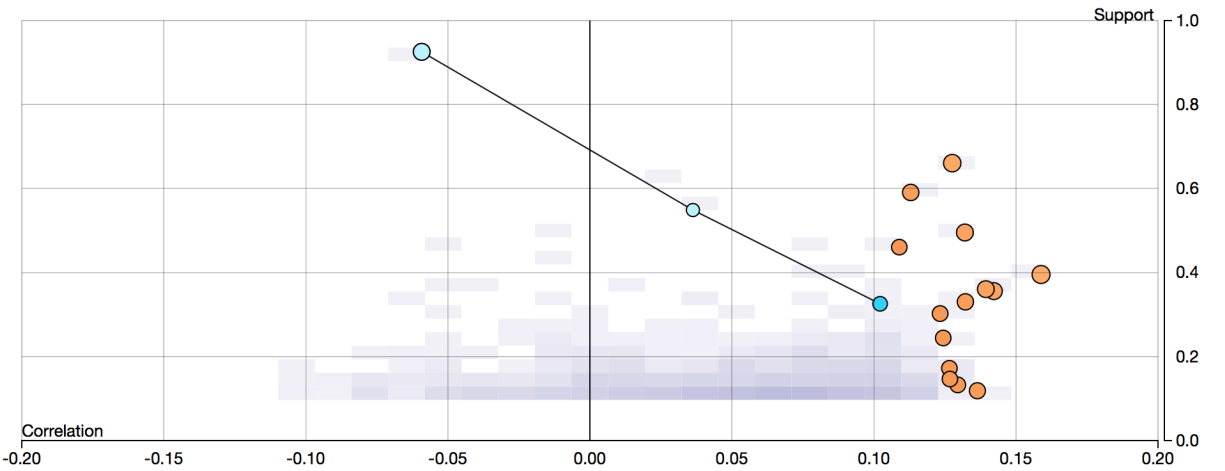
Level of Detail: 0

Maximum Length: 6

Positive Outcome Indicator: 1

Resume previous -- 2

Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path  | Extremes | List Histograms:  Real  Normalized



Support | [Correlation]

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->diuretics3
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- diuretics3-->heart failure-->glucocorticoids-->diuretics3
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3-->heart failure-->diuretics3-->chronic airways obstr
- diuretics3
- dyslipidemics, hmg coa reductase inhibitors-->angiotensin-co
- diuretics3-->heart failure-->chronic airways obstruction, not el

- heart failure
  - + ->diuretics3
  - ->chronic airways obstruction, not elsewh
  - + ->heart failure
  - + ->diuretics3
  - + ->glucocorticoids
  - + ->beta blockers2
  - + ->angiotensin-converting enzyme (ace
  - + ->no designated placement on usp mc
  - + ->bronchodilators, anticholinergic
  - + ->dyslipidemics, hmg coa reductase ir
  - + ->electrolyte/mineral replacement
  - + ->anti-inflammatories, inhaled corticos
  - >quinolones
  - >chronic bronchitis
  - >calcium channel blocking agents
  - >anticoagulants
- + ->beta blockers2
- + ->glucocorticoids
- + ->chronic airways obstruction, not elsewh
- + ->angiotensin-converting enzyme (ace) inf
- + ->no designated placement on usp model
- + ->electrolyte/mineral replacement
- + ->dyslipidemics, hmg coa reductase inhib
- + ->anti-inflammatories, inhaled corticoster
- + ->bronchodilators, anticholinergic
- + ->quinolones
- + ->anticoagulants
- + ->diuretics3
- + ->proton pump inhibitors

**Selected Pattern:** heart failure-->chronic airways obstruction, not elsewhere classified-->diuretics3  
**Support:** 140 ( 32.56% )  
**Correlation:** 0.1022  
**ΔCorrelation:** 0.0659

Pause and restart using only patients with this pattern

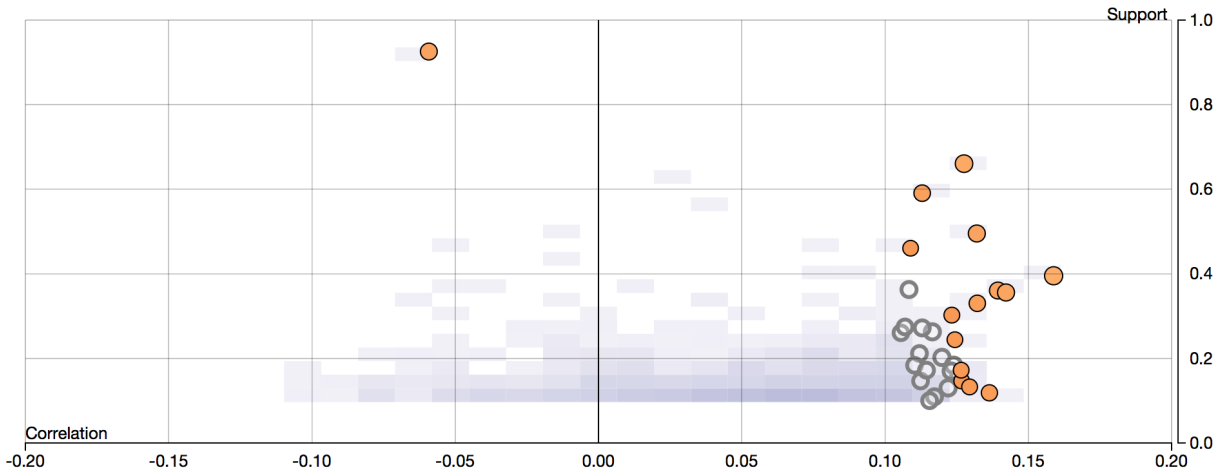
**Minimum Support Required:** 43/430 ( 15% )  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Pause and restart with new parameters | Resume previous -- 2



Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path  | Extremes | List Histograms:  Real  Normalized

Support



- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere cl
- beta blockers2
- glucocorticoids
- angiotensin-converting enzyme (ace) inhibitor
- no designated placement on usp model guid
- electrolyte/mineral replacement
- dyslipidemics, hmg coa reductase inhibitors
- anti-inflammatories, inhaled corticosteroids
- quinolones
- bronchodilators, anticholinergic
- anticoagulants
- chronic bronchitis
- calcium channel blocking agents
- proton pump inhibitors
- chronic pulmonary heart disease
- macrolides
- diuretics4
- beta-lactam, penicillins
- antidiabetic agents
- antianginal agents4
- asthma
- nonsteroidal anti-inflammatory drugs
- antibacterials, other
- cardiomyopathy
- angiotensin ii receptor antagonists
- cardiotonics4
- benign prostatic hypertrophy agents

Support

|Correlation|

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart f
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3
- anti-inflammatories, inhaled corticosteroids-->glucocorticoids
- angiotensin-converting enzyme (ace) inhibitors-->anti-inflamm
- diuretics3-->electrolyte/mineral replacement
- anti-inflammatories, inhaled corticosteroids-->angiotensin-cor
- calcium channel blocking agents-->heart failure-->calcium ch

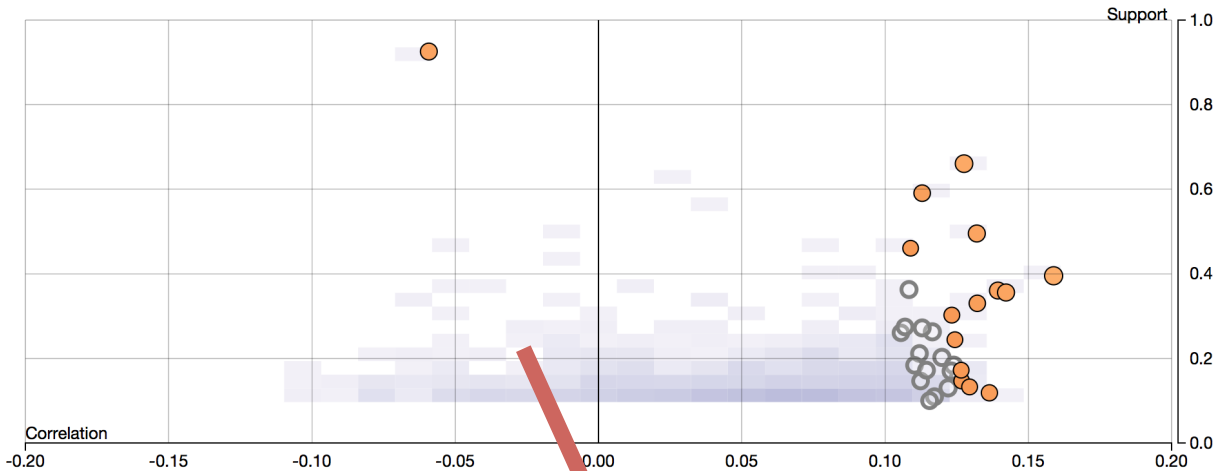
**Selected Pattern:**  
**Support:**  
**Correlation:**  
**ΔCorrelation:**

**Minimum Support Required:** 43/430 ( 10% ) [edit](#)  
**Level of Detail:** 0 [edit](#)  
**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Resume previous -- 2

Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path | Extremes | List Histograms: Real Normalized

Support



- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere cl
- beta blockers2
- glucocorticoids
- angiotensin-converting enzyme (ace) inhibitor
- no designated placement on usp model guid
- electrolyte/mineral replacement
- dyslipidemics, hmg coa reductase inhibitors
- anti-inflammatories, inhaled corticosteroids
- quinolones
- bronchodilators, anticholinergic
- anticoagulants
- chronic bronchitis
- calcium channel blocking agents
- proton pump inhibitors
- chronic pulmonary heart disease
- macrolides
- diuretics4
- beta-lactam, penicillins
- antidiabetic agents
- antianginal agents4
- asthma
- nonsteroidal anti-inflammatory drugs
- antibacterials, other
- cardiomyopathy
- angiotensin ii receptor antagonists
- cardiotonics4
- benign prostatic hypertrophy agents

Support

|Correlation|

- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere classified
- heart failure-->diuretics3
- heart failure-->chronic airways obstruction, not elsewhere clas
- diuretics3-->heart failure
- beta blockers2
- glucocorticoids
- chronic airways obstruction, not elsewhere classified-->heart f
- heart failure-->beta blockers2

- angiotensin-converting enzyme (ace) inhibitors
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
- dyslipidemics, hmg coa reductase inhibitors
- beta blockers2
- diuretics3
- anti-inflammatories, inhaled corticosteroids-->glucocorticoids
- angiotensin-converting enzyme (ace) inhibitors-->anti-inflamm
- diuretics3-->electrolyte/mineral replacement
- anti-inflammatories, inhaled corticosteroids-->angiotensin-cor
- calcium channel blocking agents-->heart failure-->calcium ch

Selected Pattern:  
Support:  
Correlation:  
ΔCorrelation:

Minimum Support Required: 43/430 ( 10% ) edit  
Level of Detail: 0 edit  
Maximum Length: 6 edit  
Positive Outcome Indicator: 1 edit

Resume previous -- 2

|Correlation|

- angiotensin-converting enzyme (ace) inhibitors
- heart failure-->angiotensin-converting enzyme (ace) inhibitors
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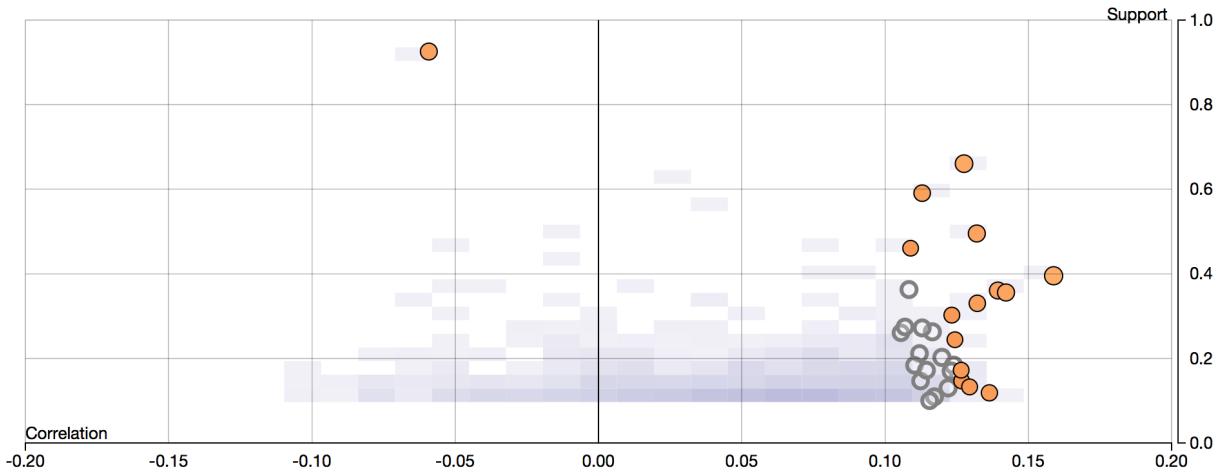
|Correlation|

- angiotensin-converting enzyme (ace) inhibitors
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Refresh Clear Fit | Show Lengths: 1 | 6 | Highlighted 15 | Show Path  | Extremes | List Histograms:  Real  Normalized

Support



- heart failure
- diuretics3
- chronic airways obstruction, not elsewhere cl
- beta blockers2
- glucocorticoids
- angiotensin-converting enzyme (ace) inhibitor
- no designated placement on usp model guid
- electrolyte/mineral replacement
- dyslipidemics, hmg coa reductase inhibitors
- anti-inflammatories, inhaled corticosteroids
- quinolones
- bronchodilators, anticholinergic
- anticoagulants
- chronic bronchitis
- calcium channel blocking agents
- proton pump inhibitors
- chronic pulmonary heart disease
- macrolides
- diuretics4
- beta-lactam, penicillins
- antidiabetic agents
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- asthma
- nonsteroidal anti-inflammatory drugs
- antibacterials, other
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- angiotensin ii receptor antagonists
- cardiotonics4
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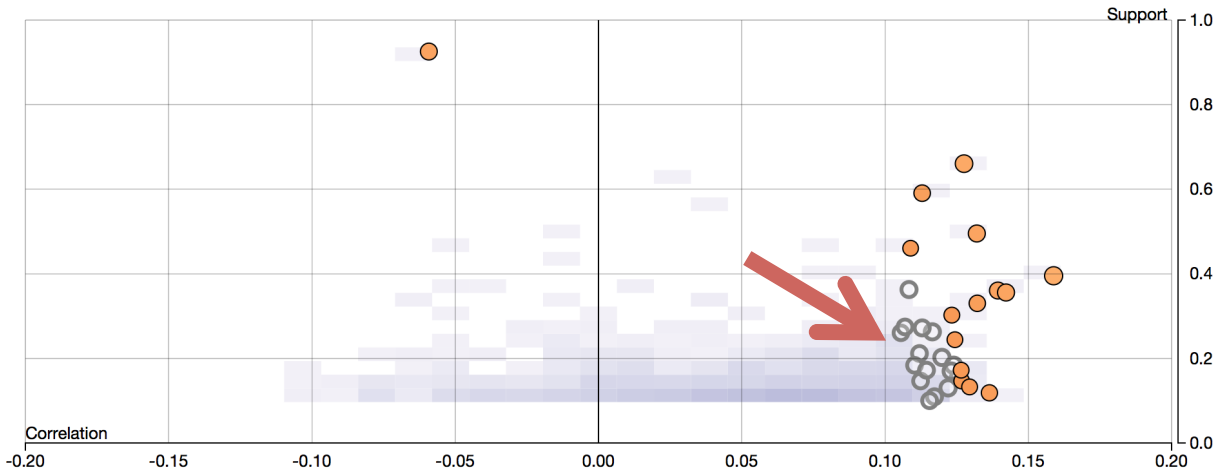
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**Maximum Length:** 6 [edit](#)  
**Positive Outcome Indicator:** 1 [edit](#)

Resume previous -- 2

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Support



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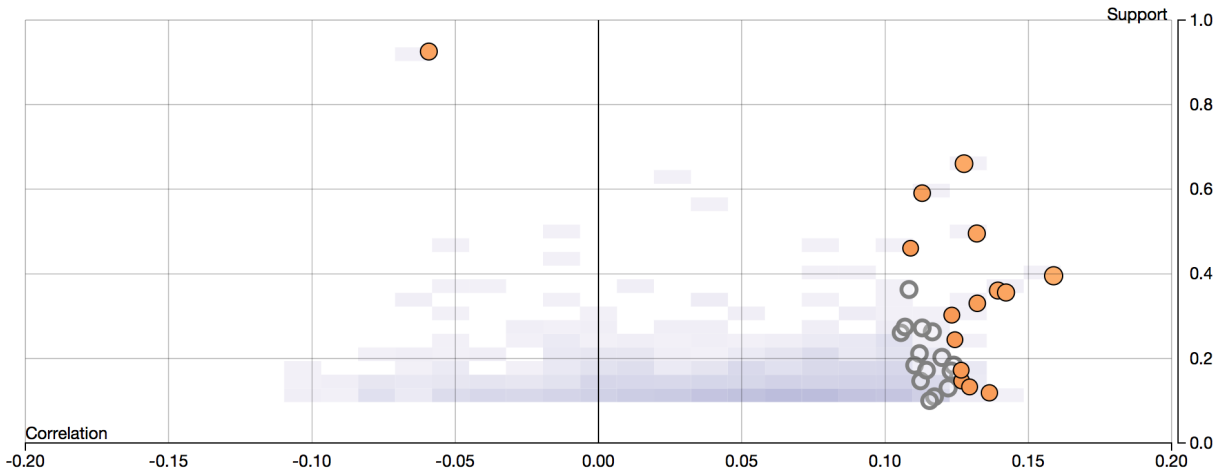
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Resume previous -- 2

Support

- heart failure
- diuretics3
  - ? ⇒ heart failure
  - ? ⇒ chronic airways obstruction, not elsewhere classified
  - X ⇒ beta blockers2
  - ⇒ glucocorticoids
  - ⇒ diuretics3
  - ⇒ chronic airways obstruction, not elsewhere classified
  - + ⇒ electrolyte/mineral replacement
  - ⇒ angiotensin-converting enzyme (ace) inhibitors
  - ⇒ diuretics3
  - ⇒ no designated placement on usp model guidelines
  - ⇒ dyslipidemics, hmg coa reductase inhibitors
  - electrolyte/mineral replacement
- + chronic airways obstruction, not elsewhere classified



Support

heart failure

diuretics3

? ⇒ heart failure

? ⇒ chronic airways obstruction, not elsewhere classifi

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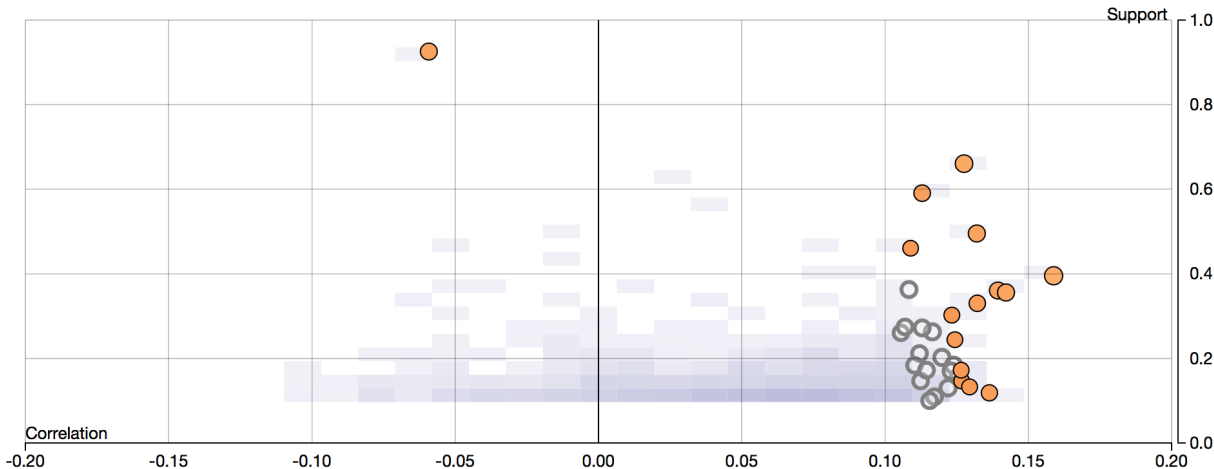
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**Positive Outcome Indicator:** 1 [edit](#)

Resume previous -- 2



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So Does it Work?



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# So Does it Work?

Medical Researchers,  
University Hospital of North Norway

---

# So Does it Work?

## AMIA 2014

Skrovseth, Perer, Delaney, Revaug,  
Lindsetmo, Augestad

"Detecting Novel Associations for  
Surgical Hospital Readmissions in Large  
Datasets by Interactive Visual Analytics"



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# Contributions

- A precise definition and design guidelines for Progressive Visual Analytics
- An example Progressive Visual Analytics system, Progressive Insights
- (In the paper) A case study of using Progressive Insights for exploring frequent patterns in EHR

---

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- A precise definition and design guidelines for *Progressive Visual Analytics*
- An example Progressive Visual Analytics system, *Progressive Insights*
- (In the paper) A **case study** of using *Progressive Insights* for exploring frequent patterns in EHR

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# Chad Stolper

Georgia Tech

chadstolper@gatech.edu



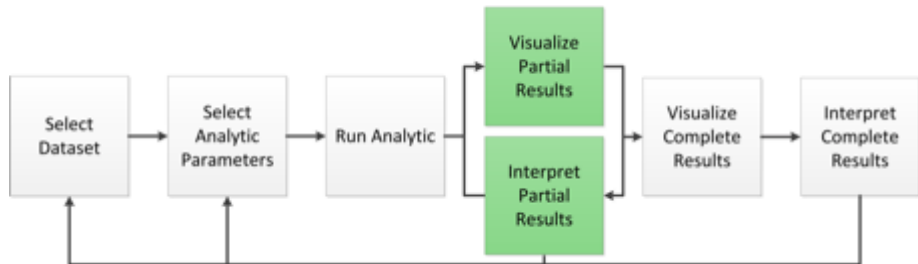
Adam Perer

IBM T.J. Watson  
Research Center



David Gotz

UNC Chapel Hill



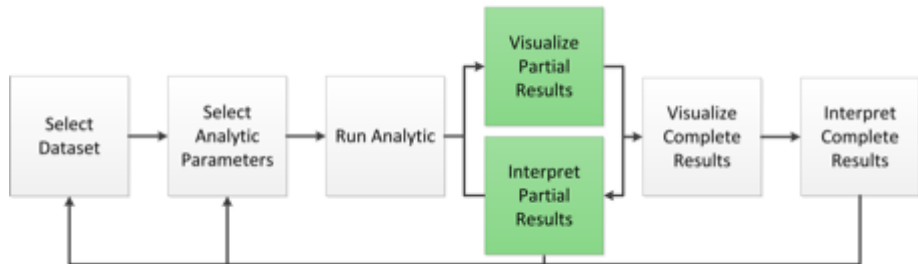
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# Thank You!

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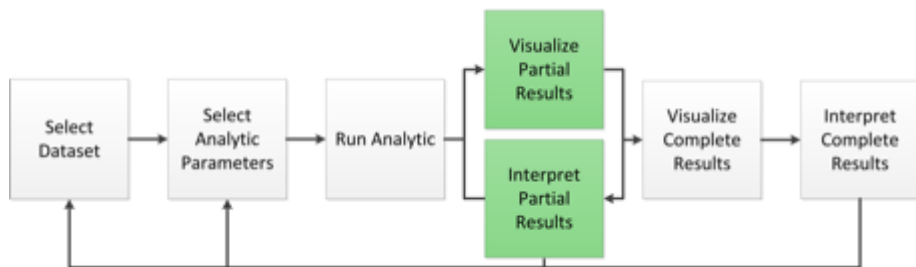


# Questions?

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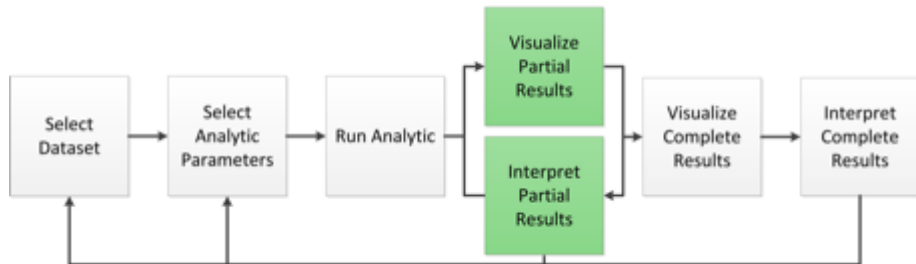
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# Progressive Visual Analytics

## Seven Design Guidelines

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# Progressive Visual Analytics Systems

Analytics should...

1. Provide increasingly meaningful partial results as the algorithm executes
2. Allow users to focus the algorithm to subspaces of interest
3. Allow users to ignore irrelevant subspaces

---

# Progressive Visual Analytics Systems

Visualizations should...

4. Minimize distractions by not changing views excessively
5. Provide cues to indicate where new results have been found
6. Support on-demand refresh
7. Provide an interface to specify where the analytics should focus and ~~ignore~~