Evaluating Clinical Quality Assurance and Quality Events:

EVT Coding & Oral Health Assessment

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What is Quality?

- Quality is described as the degree to which the entire set of characteristics of a product, process, or service satisfies established, predicted, or obvious needs
- In dentistry there is little consistency in the use of quality measures.
- Differing ideas of what it really is and can be based on individual or group interpretations.
  - In health care,– previous descriptions are generally confined to "standard of care"

Jockstad et al. (2001); Shugars & Bader (1996); Poorterman et al. (1998)

What is Quality Assurance?

- Quality assurance (QA) contains the progression of:
  - Quality assessment,
  - Identification of issues,
  - Developing a strategy for resolving problems,
  - Implementation of changes.

Poorterman et al. (1998); Jones et al. (2007)

What is Quality?

- What we should want with QA/QI:
  - Sound data that provides information for operational and clinical decision making
  - Provides information on and allows positive impact for **TRIPLE AIM**
    - Population Health
    - Experience of Care
    - Per Capita Cost
  - Ultimately leads to:

Practice Translation

What do you measure, right now?

- Gross Charges
- Net Revenue
- Expenses
- Number of visits
- Revenue per visit
- Cost per visit
- # of Unduplicated Patients
- # of New Patients
- # of Transactions
- Broken Appointment Rate
- Emergency Rate
- Payer Mix Percentages
- Scope of Service
- # FTE Providers
- # FTE Billing Staff
- A/R past 90 days
- # of Completed Treatments
- # of children receiving sealants (under 21)
- # of sealants applied
- % Children seen receiving a preventive service

safety net SOLUTIONS

Quality Versus Quantity

- Dentistry traditionally measures quantitative information.
- Works well for financial well being and evaluating access to care
  - Necessary but may not fully reflect clinical care
- Difficult to use this data to alter patient outcomes or determine success/failure of clinical changes, education programs, community outreach
- Difficult to make alterations to plans, protocols, and policies
- How good is the clinical dental care we are providing?

IDEA: EVT Coding

Quality Event Codes

- What is a quality event?
  - An occurrence or consequence relating to the patients oral health either as a result of oral health care or patient habits/behavior that may result in negative patient outcomes
    - Complications, adverse events, failures
- Quality Event Codes = **EVT Codes (EVT)**
- **Aim** is to provide baseline statistics for event reports as a means to gauge, improve, and enhance total quality assurance.
- **Objective** is to determine if relationships exist between event report rates and delivery of care, location of treatment, procedure type, oral health risk, provider, or encounter type or number.

Why EVT Coding?

- We (CSCDM) previously completed several small, clinically specific studies to evaluate quality of care such as: safety and efficacy/successful outcomes
- Needed to streamline evaluation
  - Are we doing what we say we are doing?
  - Are we clinically competent?
  - How are we effecting patient outcomes?
  - HOW CAN WE AFFECT PATIENT AND COMMUNITY OUTCOMES.

Background: How we implemented EVT Coding

- Idea was to develop a system that could review data over three years and provide a simplified method of review (***The Prospective Snapshot***)
- Identify quality events that occurred over a period of one year to create a baseline that could be used for quality improvement
- Decided to use evaluations to determine percentage of incidence (COE, POE, OE3, and specific LOE)
  - Thus, during examinations how often are these things seen, reported, or recorded.
  - Can also be thought of as how often do these occur with each treatment plan.

Background: How we implemented EVT Coding

- A standardized format was used to input a tracking code into electronic dental software (DENTRIX ENTERPRISE™).
  - The study involved a one year analysis.
- EVT (Quality Event) codes were predetermined and with each occurrence were inserted as a "dummy code" into the EDR.
- Reports were run at the end of the analysis period to determine incidence.
- Specific codes were further evaluated to provide a more positive impact on quality assurance.

EVT Coding

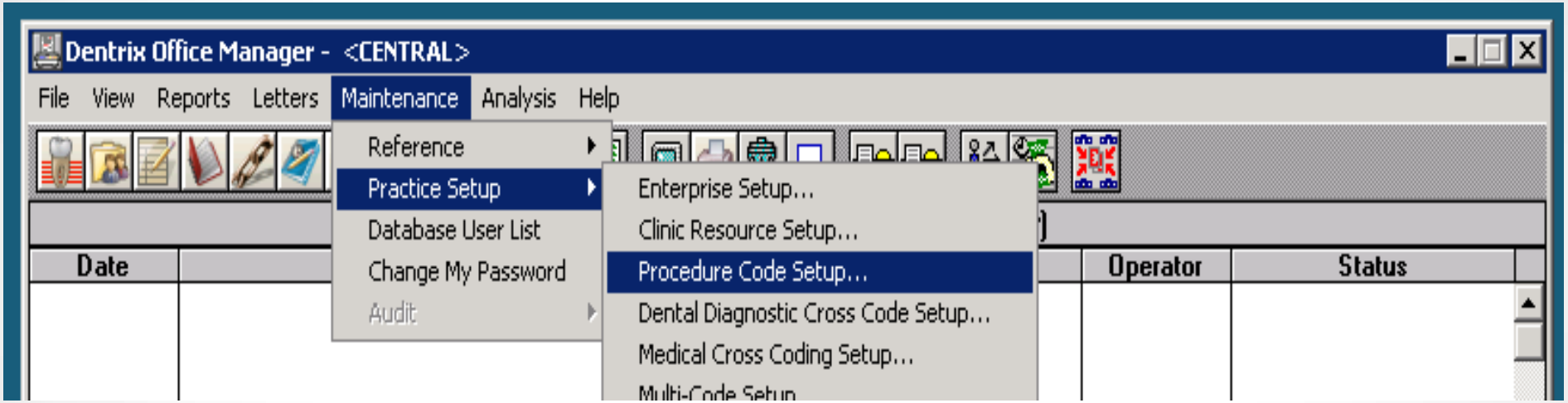
- 106 Total Codes*
  - *8 codes are Rx codes
- Categorical Arrangement
  - Anesthesiology
  - Behavior Management
  - Community Outreach
  - Endodontics
  - Implantology
  - Operative/Restorative
  - Oral Surgery
  - Orthodontics
  - Patient Compliance
  - Periodontology
  - Preventive Care
  - Prosthodontics
  - Systemic

EVT Coding

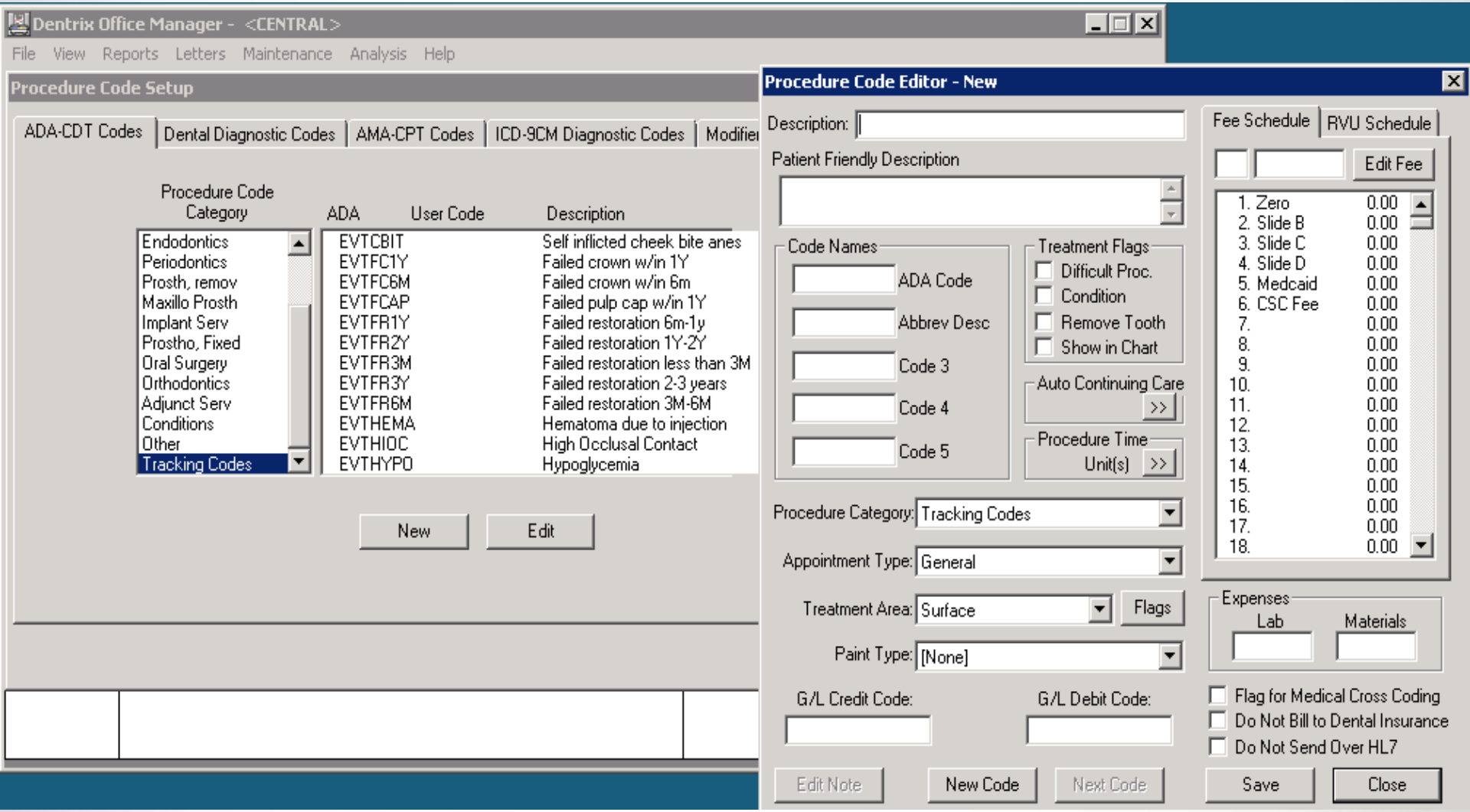
COMMUNITY OUTREACH
EVTNOTB (No Toothbrush)
PATIENT COMPLIANCE
EVTCAREST (Replace restoration new sfc caries)
EVTCAREXT (Extraction due to new sfc caries)
EVTCARSEAL (Loss of sealant due to caries)
EVTPLAQ (Prophy needed within 3 mos due to plaque/calculus build up)
EVTREPAIR (composite repair needed due to compliance issues)
PREVENTIVE
EVTCALRAD (radiographic calculus detected within 6 mos of prophylaxis)
EVTSEA18M (sealant loss more than 18 months)
EVTSEAL1Y (loss of sealant 6-12 months)
EVTSEA18L (loss of sealant 1Y-18mos)
EVTSEAL 6M (loss of sealant within 6 mos)
EVTHISEAL (high occlusion on sealant requiring adjustment – add'l encounter)
PROSTHODONTICS
EVTRCC (re cement crown less than 6 mos)
EVTRCC1 (re cement crown 6m – 1Y)
EVTRCC2 (re cement crown 1Y – 2Y)
EVTCBMAR (open margin on crown/bridge from Lab)
EVTDNSOR (multiple ulcerations due to poor denture fit less than 3 months from placement)
EVTDNTRL (denture reline needed within 3 mos of placement)
EVTCBFIT (Inadequate fit of crown/bridge from lab requiring replacement)
EVTDENT (inadequate fit of denture requiring re-send to lab or complete replacement)
BEHAVIOR MANAGEMENT
EVTN2O (loss of appointment – N2O ineffective)
EVTUNCP (uncooperative patient first visit – no care)
EVTUNCP2 (uncooperative patient 2nd visit – no care)
EVTUNCP3 (uncooperative patient 3rd visit – no care)
ANESTHESIOLOGY
EVTCBIT (cheek bite)
EVTTBIT (tongue bite)
EVTLBIT (lip bite)
EVTINANES (inadequate anesthesia – add'l injection)
EVTNUMB (pain report due to feeling numb – addl encounter)
EVTTRIS (trismus report)
EVTANSBL (bleeding with injection)
EVTHEMA (hematoma with injection procedure)
EVTPROAT (prolonged anesthesia)
EVTNVBK (undesired nerve block)
EVTSEDMD (mild complication with sedation care)
EVTSEDMO (moderate complication with sedation care)
EVTSEDSV (severe complication with sedation care)
ORAL SURGERY
EVTDRYSOK (dry socket)
EVTSUTURE (removal of suture – incomplete dissolve)
EVTBRKOS (broken tooth needing referral to OMFS)
EVTOSBD (significant bleeding from extraction requiring more than standard procedure (s) to stop)
EVTSINUS (sinus exposure during extraction)
EVTFREN (reattachment of frenum following frenectomy)
ENDODONTICS
EVTFCAP(failed pulp cap w/in 1Y
EVTFCAP2 (failed pulp cap 1-2Y
EVTFCAP3 (failed pulp cap 2-3 Y)
EVTFPOTY1 (failed pulpotomy within 1 Y)
EVTFPOTY2 (failed pulpotomy 1-2 Y)
EVTRCT (failed RCT w/in 3 mos)
EVTRCT1 (failed RCT 3 mos – 1Y)
EVTRCT2 (failed RCT 1Y-2Y)
EVTRCT3 (failed RCT 2Y-3Y)
SYSTEMIC
EVTSYNC (syncope)
EVTBP (blood pressure issue requiring referral)
EVTHTPALP (heart palpations during care)
EVTHYPO (hypoglycemia)
EVTNAVOM (nausea and vomiting)
EVTHOSP (activation of EMS or patient to hospital for emergency event)
OPERATIVE/RESTORATIVE
EVTFC1Y (failed SSC within 1 Y)
EVTFC2 (failed SSC 1-2Y)
EVTFR1Y (failed restoration 6m-1Y)
EVTFR2Y (failed restoration 1Y-2Y)
EVTFR3Y (failed restoration 2-3Y)
EVTRSOUT(complete loss of filling w/in 3 months
EVTRSOUT1 (complete loss of filling 3 mos – 1Y)
EVTHIOC (high occlusal contact on restoration)
EVTOVHG (restoration with overhang present)
EVTPAIN (pain from restorative procedure, add'l encounter)
EVTREPA (composite repair during to operative issue)
EVTFC6M (failed SSC within 6 mos)
EVTFR3M (failed restoration less than 3 mos.)
EVTFR6M (failed restoration 3-6 mos)
ORTHODONTICS
EVTBRKL (missing or loose brackets w/in 1 month)
EVTBRKL1 (missing or loose brackets 1-3 months)
EVTBRK2 (missing or loose brackets 3-6 months)
EVTBRK3 (missing or loose brackets 6m-1Y)
EVTBRK4 (missing or loose brackets 1Y-2Y)
EVTBRK5 (missing/loose bracket 2-3Y)
EVTORCAP (orthodontic relapse within one year after appliance/braces removal)
EVTORCAP2 (orthodontic relapse 1-2Y after appliance/braces removal)
EVTORCAP3 (orthodontic relapse 2-3Y after appliance/braces removal)
EVTBAND (orthodontic appliance band breakage)
EVTORCAR (caries observed with appliance/braces removal)
EVTORREM (significant remineralization w/ applicance/braces removal)
EVTORFM (mild malocclusion present at end of orthodontic treatment)
EVTORFMO (moderate malocclusion present at end of orthodontic treatment)
EVTORFSV (severe malocclusion present at end of orthodontic treatment)
PERIODONTOLOGY
EVTTHLSS (los of tooth/teeth due to failed periodontal therapy)
EVTGFTRE (Graft rejection & failure w/in 3 mos of placement)
EVTGFTRE1 (Graft rejection & failure w/in 3 mos of placement)
EVTGFTRE2 (Graft rejection 6mos-1Y)
EVTPOCKET (presence of persistent residual periodontal pockets after 18 mos from perio therapy initiation)
EVTMOBIL (increase in tooth mobility grade after 18 mos from perio therapy initiation)
EVTLENGTH (failure of crown lengthening)
IMPLANTOLOGY
EVTIMFAIL (failure of implant within 3 mos)
EVTIMFAIL1 (failure of implant 3-6 mos)
EVTIMFAIL2 (failure of implant 6m-1Y)
EVTIMFAIL3 (failure of implant 1y-2Y)
EVTIMFAIL4 (failure of implant 2-3Y)
RX CODING
EVTANTI (antibiotic Rx)
EVTVAL (valium Rx)
EVTHAL (halcion Rx)
EVTIBUP (ibuprofen Rx)
EVTOPID (opioid Rx)
EVTSTER (steroid Rx)
EVTFLUO (fluoride Rx)
EVTCHLOR (chlorhexidine Rx)

EDR & EVT Code Entry

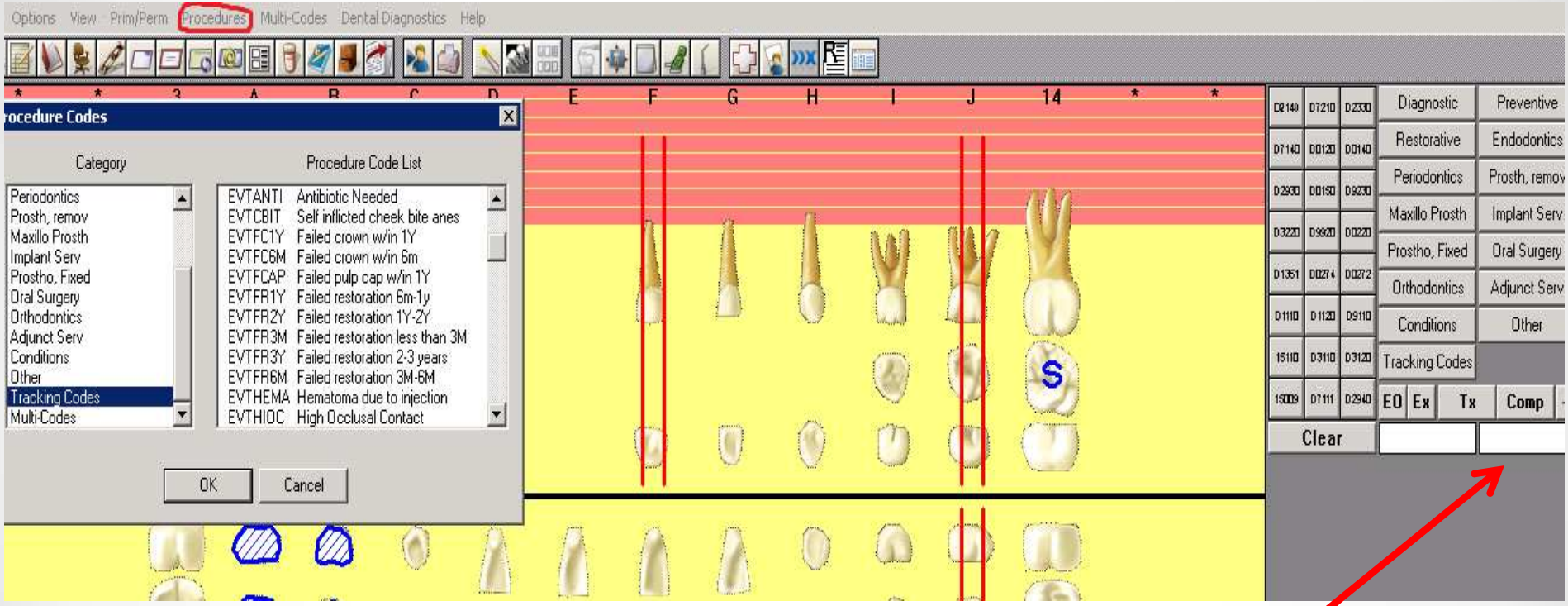
- Creation of Dummy Coding / Tracking Codes



EVT Code Entry



Clinical Entry

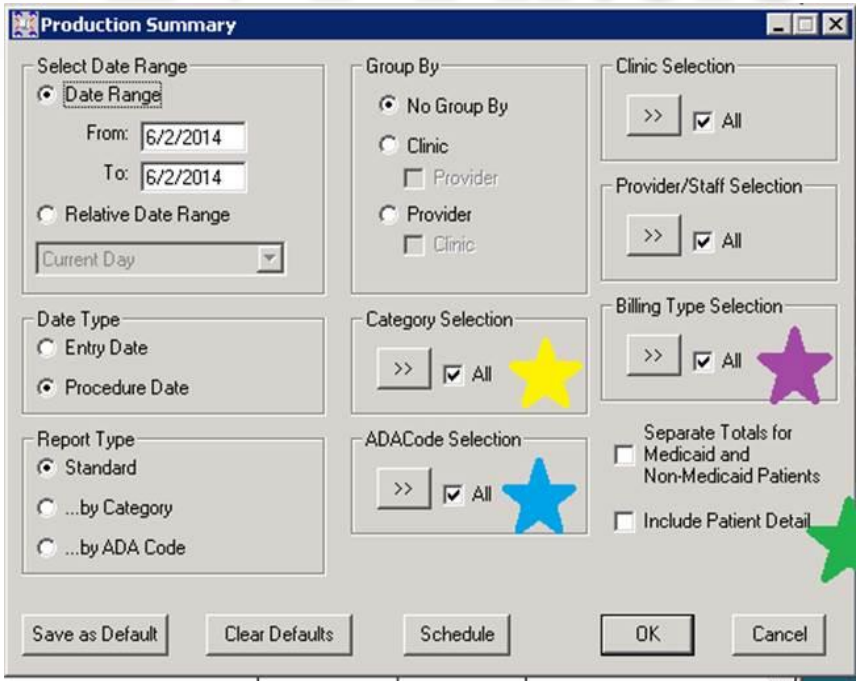


Or, if the EVT Code is known, one can manually enter

EVT Reports

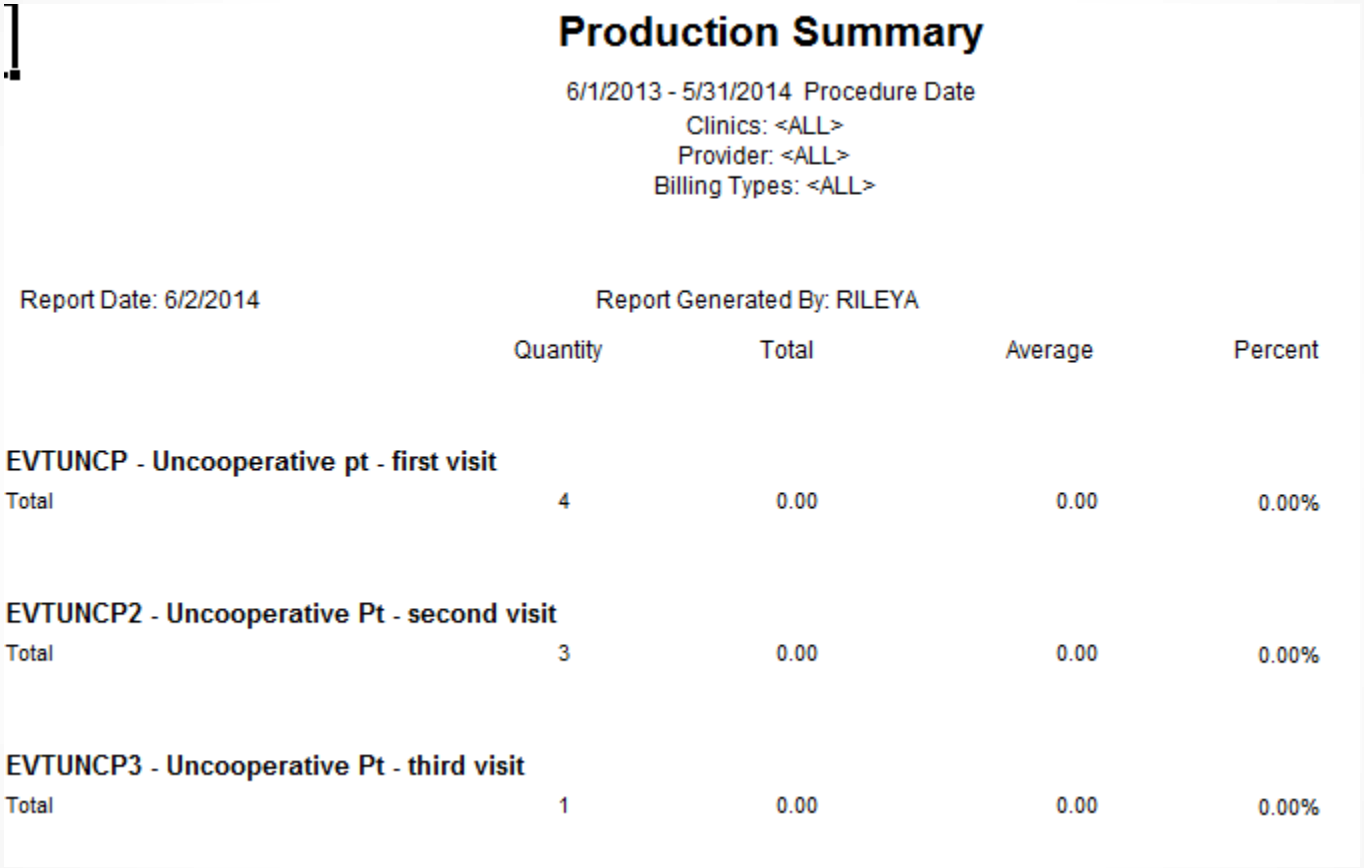
- Clicking on the DXONE icon will open the report selection window. Analysis -> Production Summary (Report that is ran when EVT Codes in Adjustment Categories).

EVT Filters



- If you set up a new "category" of which to assign tracking codes (ex."event codes"), this is where you would choose the correct category as a filter.
- You can filter the report by ADA codes (previously listed as tracking codes).
- Bill Type (Best filter for information we have)
- Include patient names in filter. Once this is clicked, the Report Type needs to match.

EVT Reports



Production Summary

6/1/2013 - 5/31/2014 Procedure Date
Clinics: <ALL>
Provider: <ALL>
Billing Types: <ALL>

Report Date: 6/2/2014 Report Generated By: RILEYA

	Quantity	Total	Average	Percent
EVTUNCP - Uncooperative pt - first visit				
Total	4	0.00	0.00	0.00%
EVTUNCP2 - Uncooperative Pt - second visit				
Total	3	0.00	0.00	0.00%
EVTUNCP3 - Uncooperative Pt - third visit				
Total	1	0.00	0.00	0.00%

EVT Analysis

- 2473 total evaluations
- 571 Quality Events recorded
- 39 of 98* EVT codes reported
  - *Does not include Rx codes for this analysis
- 23.1% EVT code rate

EVT Category Report

EVT Category	Number of Reports	% of EVT	% of EVAL
Community Outreach	206	36.1%	8.3%
Patient Compliance	168	29.4%	6.8%
Preventive	106	18.6%	4.3%
Restorative/Operative	40	7.0%	1.6%
Anesthesiology	35	6.1%	1.4%
Behavior Management	9	1.6%	0.4%
Endodontics	7	1.2%	0.3%

EVT Report (Top 5)

EVT CODE	Number of Reports	% of EVT	% of EVAL
EVTNOTB (No Toothbrush)	206	35.1%	8.3%
EVTCARSEAL (Loss of sealant due to caries)	55	9.6%	2.2%
EVTSEAL1Y (Loss of sealant 6-12 months)	45	7.9%	1.8%
EVTPLAQ (Additional prophylaxis needed due to plaque/calculus build up within 3 months)	44	7.7%	1.8%
EVTCAREST (Replace/Loss of restoration due to new surface caries)	40	7.0%	1.6%

EVT Report

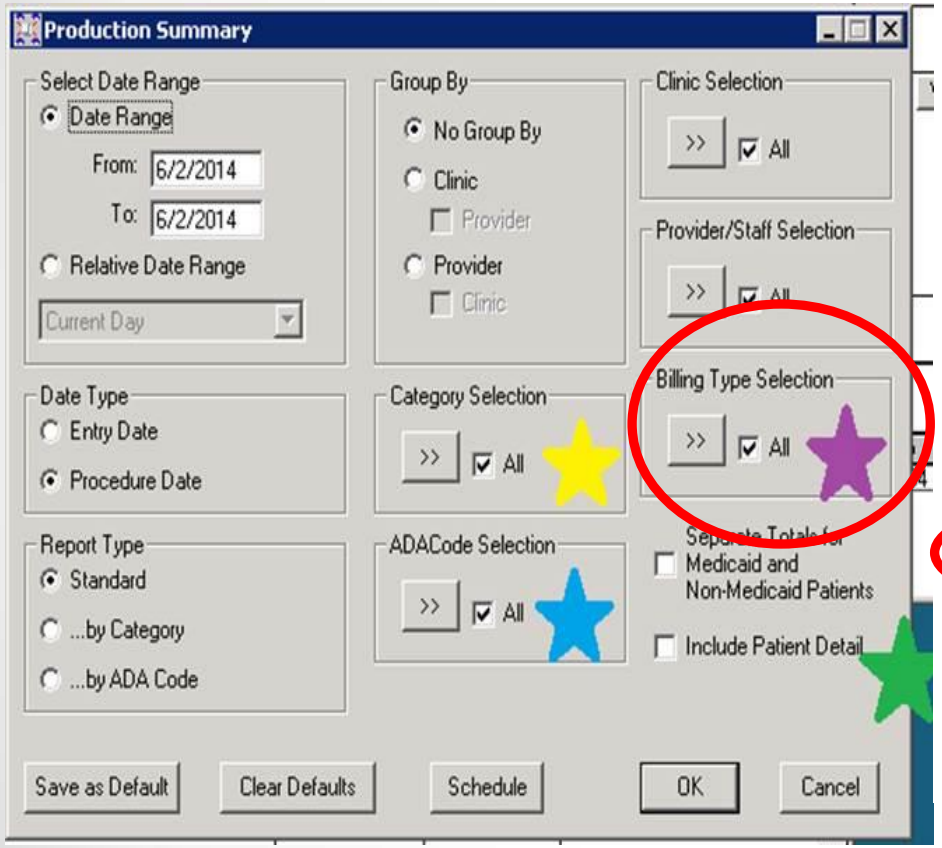
- COMMUNITY OUTREACH

EVT Code	Description	Total	Percentage
EVTNOTB	No toothbrush reported at home *(No toothbrush/shares with other family members/no toothbrush at all residence locations)*	206	8.33%

Quality Application / Practice Translation

- No toothbrush report is actually part of our performance improvement plan
- Tracking this since 2012
- Decrease from 30.1% (FY2012) to 13.3% (FY2013) to 9.4% (FY2014) [*based on patient #]
  - 8.3% (based on total evaluation #)
- Try to get as many toothbrushes into community as possible
- Use location data (zip code or billing type (school name)) to determine highest need areas
  - Use limited resources to fullest potential
  - Focus on health fairs in area
  - Local festivals
  - Other community outreach avenues

Process of Quality Evaluation



After selecting the date range, there are many filters to work with to get the report needed. Some that I find most useful are:

- If you set up a new "category" to assign tracking codes to (ex. "tracking codes", "event codes"), this is where you would choose the correct category as a filter.
- You can also filter the report by selecting which "ADA" codes (you would have your tracking codes listed as ADA codes)
- Bill Type is one of the biggest reporting filter, keep this in mind when determining how your office defines this and why.
- This filter will provide names of patients listed with the tracking code

Once the decision is made to filter the report using Category Selection or ADA Code Selection, the Report Type needs to match (lower left selection)

EVT Report

- **PATIENT COMPLIANCE**

EVT Code	Description	Total	Percentage
EVTCARSEAL	Loss of sealant due to caries (sealant still present)	55	2.22%
EVTPLAQ	Patient needs additional prophylaxis within three months due to plaque/calculus build up	44	1.78%
EVTCAREST	Loss/replacement of restoration due to new surface caries	40	1.62%
EVTREPAIR	Composite repair contained to enamel due to patient compliance issues	22	0.89%
EVTCAREXT	Extraction due to new surface caries on tooth with previous restoration	7	0.28%

Quality Application/ Practice Translation

- Patient compliance can be the heaviest burden for a dental program
- How do you transform culture or social determinants, remove denial, change priorities?
- Knowledge
  - "Sometimes I'm confused by what I think is really obvious. But what I think is really obvious obviously isn't obvious..." (Michael Stipe)
  - "Information is not knowledge" (Albert Einstein)
- Educational Protocols
  - Community Outreach
  - Chairside/Clinical
  - During front office patient contact / the subliminal method
  - Through community leadership

EVT Report

- **PREVENTIVE**

EVT Code	Description	Total	Percentage
EVTSEAL1Y	Loss of sealant 6-12 months	45	1.82%
EVTSEAL6M	Loss of sealant within 6 mos.	26	1.05%
EVTSEAL18	Loss of sealant more than 18mos – less than 3 years	21	0.85%
EVTCALRAD	Radiographic calculus detected less than 6 months of prophylaxis	7	0.28%
EVTHISEAL	High occlusion on sealant resulting in additional encounter	4	0.16%
EVTSEA18L	Loss of sealant 1 year – 18 months	3	0.12%

Sealant Retention Rates

- Most evidence states: expected sealant retention rate at approximately 45-65%.
  - A **52.7% retention rate** was found with school based placement on children from low income backgrounds
- Most research downplays retention.
- Identified variables include:
  - Patient cooperation
  - Isolation techniques
  - Age of patient
  - Operator experience
  - Tooth location
  - Field of view
  - Number of operators

Mertz Fairhurst et al. (1984); Feigal (1998); Muller-Bolla et al. (2013)

Quality Application/ Practice Translation

- Even though retention was at approx. 85%: CSCDM felt event to address is loss of sealant
- We replace each sealant that is lost (3 year maintenance)
  - Increase time
  - Cost of materials
  - Caries susceptibility
  - Lost revenue
- First make sure all personnel are following evidence based care for placement – interview/ask
  - (prn Training)
- Next step is to identify variables & possible issues to improve these percentages
  - Manually looked at patient base – overweight/obese patients made up approximately 50% of patient's with lost sealants in first year
    - Obesity/weight a complicating factor in dentistry
    - **PRACTICE TRANSLATION– patients that fit Obese/OW status when possible have team to place sealants**
  - New technique out of a Texas based school program using Hydrogen Peroxide with cotton tip applicator [prior to etching] for better retention

Boynes et al. (2013); Cheymol (2000); Ebbeling et al. (2002)

EVT Report

- RESTORATIVE/OPERATIVE

EVT Code	Description	Total	Percentage
EVTHIOC	High occlusal contract restorative; additional encounter	17	0.69%
EVTFR2Y	Failed restoration 1Y-2Y	7	0.28%
EVTFR1Y	Failed restoration 6m-1Y	4	0.36%
EVTPAIN	Pain from procedure requiring additional encounter	4	0.16%
EVTFR3Y	Failed restoration 2Y-3Y	3	0.12%
EVTREPA	Composite repair due to operative issue	2	0.08%
EVTFC1Y	Failed SSC crown pedo within 1 Y	1	0.04%
EVTFC2	Failed SSC crown pedo 1Y – 2Y	1	0.04%
EVTOVHG	Interproximal restoration with overhang observed at additional encounter	1	0.04%

Quality Application/ Practice Translation

- While there are many other aspects to quality care with operative procedures – the dental profession tends to focus on success/failure of fillings
  - About 60% of all operative work done is attributed to the replacement of restorations.
- While most aspects of operative care QA are limited in literature, annual failure rates with fillings can be ascertained
- The structure of these studies' designs make it difficult to apply with the EVT coding as a direct comparison
  - Limitation in that until concrete benchmarks are established would have to use total fillings placed as comparison and manually calculate using other software.

Mjor (1989)

Table 1 – Results from the literature search: clinical trials with follow-up periods of at least 5 years published between 1996 and 2011.

Author, year	Evaluation period/study design[a]	Materials tested	Evaluated restorations	AFR[b]/outcome/survival rate of composite	Factors associated with composite failure
Da Rosa Rodolpho et al., 2011 [3]	22 years, RL	Composite	Class I and II	AFR: between 1.5% and 2.2%	Tooth type, cavity size, material
Opdam et al., 2010 [12]	12 years, RL	Composite vs. amalgam	Large Class II	AFR: 1.68%	Caries risk
Fokkinga et al., 2008 [104]	17 years, PL	Composite	Endodontically treated teeth with or without a prefabricated metal post	AFR: 2.8% (restoration level) and 1.2% (tooth level)	No factors associated
Bernardo et al., 2007 [8]	7 years, PL	Composite vs. amalgam	Class I and II	AFR: 2.1%	Secondary caries
Opdam et al., 2007 [24]	9 years, RL	Composite	Class II with a total-etch technique or with glass-ionomer lining	AFR: 1.3% (total-etch) and 3.3% (glass-ionomer lining)	Presence of a lining, caries risk
Opdam et al., 2007 [13]	5 and 10 years, RL	Composite vs. amalgam	Class I and II	AFR: 1.7% (5 years) and 1.8% (10 years)	Amount of restored surfaces
Soncini et al., 2007 [9]	5 years, PL	Amalgam vs. composite/compomer	Children aged 6–10 with more than one posterior restoration	AFR: 2.98%	Number of restorations, cavity size
Lindberg et al., 2007 [105]	9 years, PL	Composite/composite–compomer open sandwich	Class II	AFR: 1.1%	No factors associated
Gordan et al., 2007 [55]	8 years, PL	Composite	Class I and II	AFR: 0%	Not investigated
Da Rosa Rodolpho et al., 2006 [2]	17 years, RL	Composite	Class I and II	AFR: 2.4%	Tooth, cavity type, cavity size
Burke et al. and Lucarotti et al., 2005 [27–29,37]	Up to 10 years, RS	Amalgam, composite and glass-ionomer	Class I and II	AFR: 8.4% (5 years) and 5.7% (10 years)	Operator: age, country of qualification, employment status; Clinical: cavity size, root filling; Patient: age, charge-paying status, practice assiduity
Nagasiri et al., 2005 [106]	5 years, RL	Composite, amalgam and OZE	Endodontically treated molars	AFR: 12.4%	Remaining coronal tooth structure
Mannocci et al., 2005 [107]	5 years, PL	Amalgam/composite with post, endodontically treated tooth	Class II	AFR: 2%	More root fracture with amalgam, more secondary caries with composite
Opdam et al., 2004 [40]	5 years, RL	Composite	Class I and II placed by dental students	AFR: 2.6%	Operator: year of graduation; Clinical: proximal contact status
Andersson-Wenckert et al. 2004 [30]	9 years, PL	Composite and glass-ionomer, open sandwich	Class II	AFR 3.2%	Not investigated
Coppola et al., 2003 [39]	5 years, RS	Composite vs. amalgam	Posterior restorations with 2 surfaces at least	Average longevity: 42 months	Dentist experience
Hayashi and Wilson, 2003 [108]	5 years, PL	Composite	Class I and II	AFR: 3.76%	Marginal deterioration, cavomarginal discoloration

Demarco et al. (2012)

– Table 1 (Continued)

Author, year	Evaluation period/study design[a]	Materials tested	Evaluated restorations	AFR[b]/outcome/survival rate of composite	Factors associated with composite failure
Pallesen and Qvist, 2003 [25]	11 years, PL	Composite, direct vs. indirect	Medium to large Class II	AFR: 1.45%	Tooth type
Turkun et al., 2003 [76]	7 years, PL	Composite	Class I and II	AFR: 0.82%	No factors associated
van Nieuwenhuysen et al., 2003 [26]	5–22 years, RL	Amalgam, composite and crowns	Posterior extensive restorations	Average survival time: 7.8 years	Clinical: tooth type, extension of restoration, pulpal vitality, use of base material; Patient: age, 3-year period of treatment
Busato et al., 2001 [109]	6 years, PL	Composite	Class I and II	AFR: 2.5%	Not investigated
Gaengler et al., 2001 [31]	10 years, PL	Composite with glass ionomer cement	Class I and II	AFR: 2.6%	Not investigated
Kohler et al., 2000 [51]	5 years, PL	Composite	Class II	AFR: 5.5%	Caries risk
van Dijken, 2000 [110]	11 years, PL	Composite, direct inlays/onlays and restorations	Class II	AFR: 1.6% (inlays/onlays) and 2.5% (direct restorations)	Tooth type
Wassel et al., 2000 [111]	5 years, PL	Composite, direct vs. inlay	Class I and II	AFR: 1.5%	Not investigated
Lundin and Koch, 1999 [112]	5 and 10 years, PL	Composite	Class I and II	AFR: 2% (5 years) and 2.1% (10 years)	Not investigated
Raskin et al., 1999 [41]	10 years, PL	Composite	Class I and II	AFR: 8.6%	Not investigated
Wilder et al., 1999 [113]	17 years, PL	Composite	Class I and II	AFR: 1.4%	Not investigated
Collins et al., 1998 [73]	8 years, PL	Composite	Class I and II	AFR: 1.71%	Not investigated
Mair, 1998 [74]	10 years, PL	Composite vs. amalgam	Class II	100% of success	Not investigated
Nordbo et al., 1998 [75]	10 years, PL	Composite	Saucer-shaped Class II	AFR: 3.0%	Not investigated

Studies using secondary data are highlighted in gray.

[a] R: retrospective; P: prospective; L: longitudinal; S: secondary data acquisition.

[b] AFR: annual failure rate.

Demarco et al. (2012)

Restoration Failure

- Reported annual failure rates (AFR): 0-12.4%
- 90% of the clinical studies indicated that annual failure rates between **1% and 3%** can be achieved with Class I and II posterior composite restorations (although these evaluations tend to review with ideal conditions during study analysis)
- Variables do exist that can cause AFR to increase:
  - Tooth type and location
  - Cavity size
  - Experience of operator
  - Number of surfaces (each additional surface may increase failure rate by 40%)
  - Patient behavior during care visit
  - Socioeconomic status
  - Caries Risk
  - Bruxism
  - Materials used (minor effect with a cascading change)

Demarco et al. (2012); Hickel & Manhart (2001); Lucarotti et al. (2005)
Opdam et al. (2007); Manhart et al. (2004)

EVT & Restoration Failure

- Total failure data: 14 events
- Mean yearly total fillings placed in analysis period: 1302
- **AFR: 1.1%**
  - **AFR: 1.2% (w/ 16 events if composite repair data is included)**
- *Limitation of AFR with this data set is that we are comparing using 5 year data and this analysis looks at 3 years of data

EVT Report

- **ANESTHESIOLOGY**

EVT Code	Description	Total	Percentage
EVTINANES	Inadequate anesthesia; requiring additional injection	21	0.85%
EVTLBIT	Self-inflicted soft tissue injury – Lip Bite	7	0.28%
EVTNUMB	Pain report due to feeling numb; additional encounter	4	0.16%
EVTCBIT	Self-inflicted soft tissue injury – Cheek Bite	1	0.04%
EVTTBIT	Self-inflicted soft tissue injury – Tongue Bite	1	0.04%
EVTTRIS	Trismus Report	1	0.04%

Quality Application/ Practice Translation

- Due to previous anesthesia study, this data allows us to evaluate success/failure of clinical changes.
- Reveals a decrease in overall anesthesia complication rate (5.3% to 3.4% [1.9% improvement!])
- Saw an increase in "inadequate anesthesia-need for additional injection" (1.2% to 2.0%)
- Clinical changes
  - ADHD and Obese/Overweight patients receive OraVerse®
  - Elimination of the mandibular inferior alveolar nerve block as standard injection for mandibular procedures

Boynes et al. (2013)

EVT Report

- **BEHAVIOR MANAGEMENT**

EVT Code	Description	Total	Percentage
EVTUNCP	Uncooperative first visit (no procedures billed – excludes D9920)	4	0.16%
EVTUNCP2	Uncooperative second visit (no procedures billed – excludes D9920)	3	0.12%
EVTUNCP3	Uncooperative second visit (no procedures billed – excludes D9920)	1	0.04%
EVTN2O	Loss of appointment – nitrous oxide inadequate to complete care	1	0.04%

EVT Report

- ENDODONTIC

EVT Code	Description	Total	Percentage
EVTFCAP	Failed pulp cap within 1 Y	4	0.16%
EVTFCAP3	Failed pulp cap within 2Y-3Y	2	0.08
EVTFCAP2	Failed pulp cap 1Y-2Y	1	0.04%

Quality Application/ Practice Translation

- 0 failed pulpotomies
  - AFR Total Range: 0.3%-18.1%
  - According to evidence based care 5-8% AFR can be achieved
  - *CSC did a decreased number of pulpotomies; instead using evidence based care recommendations of more indirect pulp caps (use of CaOH or BioCap)
- CSC: Failed pulp caps: **7 events (AFR: 2.9%)**
  - AFR Range: 0-6.2%
  - According to evidence based care 2-4.5% AFR can be achieved
  - *Limited number of research reports evaluating pulp capping as a singular investigative procedure

- Farooq et al. (2000); Nirschl & Avery (1983); McDonald & Avery (1994)

Pulpotomy

Table 1. Pulpotomy Studies In Chronological Order

Study	Sample size	Inclusion criteria	Follow-up	Type of IPT	Sample size at conclusion	Success
Redig[14] 1968	40	Deep caries	18 months	Single visit Two visit	40	85% 90%
Rolling & Thylstrup[16] 1975	98	Carious exposure	36 months	Single visit Two visit	86	70%
Morawa et. al.[17] 1975	125	Carious exposure	36-60 months	1/5 dilution formocresol pulpotomy	?	98%
Willard[15] 1976	30	Deep caries with or without Elicited pain	6-36 months	4 minute formocresol pulpotomy	?	77%
Schroder[26] 1978	33	Coronal chronic pulpitis	24 months	Pulpotomy with $Ca(OH)_2$ base	?	59%
Wright & Widmer[27] 1979	184	Vital & non-vital pulpotomy	30 months	Oxypara or formocresol pulpotomy	?	80%
Mejare [12] 1979	81	Coronal chronic pulpitis total chronic pulpitis	30 months	5 minute formocresol pulpotomy	74	55%
Fuks & Birnstein[28] 1981	77	Carious exposure	4-36 months	1/5 dilution formocresol pulpotomy	70	94%
Boeve & Dermaut[13] 1982	137	Carious exposure Pulpitis Necrosis or abscess	4-36 months	Tempophore pulpotomy One visit and two visit	?	87%
Heilig et al.[29] 1984	17	Coronal chronic pulpitis	3-6 months	Pulpotomy with $Ca(OH)_2$ base	17	88%
Hicks et al.[20] 1986	164	Caries trauma	24-87 months	Dry cotton pellet then ZOE with formocresol	retrospective	94%
Van Amerongen et. al.[30] 1986	152	Carious exposure	6-84 months	5 minute formocresol pulpotomy	141	78%
Fuks et al.[31] 1990	53	Carious exposure	25 months	2% glutaraldehyde	?	83%
Fei et. al. [32] 1991	83	Carious exposure	12 months	1/5 dilution formocresol pulpotomy Ferric sulfate pulpotomy	56	FC 96% FeS 100%
Tsai et al.[33] 1993	258	Carious exposure	36 months	5% & 2% buffered & unbuffered glutaraldehyde	150	Overall success rate 79%
Mack & Dean et. al.[34] 1993	164	Carious exposure	1-60 months	Electro-surgical pulpotomy	retrospective	99%
Roberts[21] 1996	205	Vital pulp Non-vital pulp	6-91 months	5 minute formocresol pulpotomy	175	Vital 99% Non-vital 85%
Fishman et al.[35] 1996	47	Carious exposure	6 months	Electro-fulguration pulpotomy and	47	ZOE 77% $Ca(OH)_2$ 81%

Farooq et al. (2000)

Indirect Pulp Cap

Table 2. IPT Studies in Chronological Order

Study	Sample size	Inclusion criteria	Follow-up	Type of IPT	Sample size at conclusion	Success
Aponte[9] 1966	30	Deep caries	6-36 months or more	Indirect pulp cap with $Ca(OH)_2$ base	30	100%
Kerkhove[8] 1967	56	Deep caries	12 months	Indirect pulp cap with $Ca(OH)_2$ Base or ZOE base	56	89%
Nordstrom[7] et al. 1974	25	Deep caries	3 months	Indirect pulp cap with $Ca(OH)_2$ Or 10 % SnF	?	85%
Sawusch[6] 1982	136	Deep caries	12-24 months	Indirect pulp cap with $Ca(OH)_2$ (Dycal) base	?	96%
Nirschl and Avery[24] 1983	35	Deep caries	6 months	Indirect pulp cap with $Ca(OH)_2$ base	?	94%

Farooq et al. (2000)

Looking at the Future

- **Oral Health Risk Assessment (OHRA Score)**
- An important aspect to total quality assurance
- Used as a measuring tool along side EVT Coding
  - There is a symbiotic relationship
  - One helps support the other
- A standardized process used to score each patient's risk to poor oral health outcomes
- Developed by merging available CRA forms and using same time data
- Provides a numerical value to the patient's oral health (caries) risk

ORAL HEALTH RISK ASSESSMENT FORM

Contributing Conditions:	Low Risk (0)	Moderate Risk (1)	High Risk (5)
Fluoride Exposure (through drinking water, supplements, professional applications) *[Professional applications for more than two years prior to assess of low risk]*	Yes	No	
Consumption of Sugary Foods or Drinks *[Patient admits to consumption at regular intervals more than twice per day and does not brush and/or rinse with water after consumption is considered high risk]*	Primarily at meal times		Frequent or prolonged exposure
Dental Home: established patient of record, receiving regular dental care in a dental office *[base for periodic or comprehensive evaluations four times over a two year period]*	Yes		No
Dental Knowledge: basic understanding of home oral hygiene *[daily brushing habits; frequency of dental visits; understanding of cause of cavity]; Measure parent's knowledge if child 6 years of age or younger*	Yes	No	
Health Conditions:			
Cancer/Radiation Therapy	No		Yes
Mental Disorders/disease that can affect oral health *[Drug/Alcohol abuse; eating disorders; phobias relating to dental/medical conditions]*	No	Yes	
Diabetic	No	Stable A1C	A1C >9
Special Needs	No	Yes	Yes
Smoker	No	Yes	
Clinical Conditions:			
Cavitated or Non-Cavitated (Incipient) Carious Lesions or Restorations (visually or radiographically evident)	No new carious lesions over last 24 months	1 or 2 new carious lesions over last 24 months	3 or more new carious lesions over last 24 months
Visible plaque	No	Yes	
Visible calculus	No	Yes	
Unusual tooth morphology	No	Yes	
Exposed root surfaces	No	Yes	
Periodontal attachment loss	No	>5mm	>7mm
Recurrent decay with previous restorations, faulty restorations, failed previous dental restorations	No	1 or 2 failed/faulty restorations	3 or more failed restorations
Dry Mouth (Xerostomia)	No	Taking OTC or RX to treat	Not actively treating or within first 6 months of recommended treatment

Assessment Score of 15 or Higher = Significant Oral Health Risk (Treat as High Caries Risk)
Assessment Score of 35 or Higher = Recommend Patient to be Placed on 3 Month Recall Status
*Max Value of 55

Oral Health Risk Assessment Score

- Characteristics of Assessment
  - Contributing Conditions
    - Fluoride Exposure
    - Sugar Consumption
    - Dental Home
    - Dental Knowledge
    - Parental Characteristics
  - Health Conditions
    - Chemo/Rad Therapy
    - Psychological Conditions
    - Diabetes
    - Cardiovascular Disease
    - HIV/AIDS
    - Special Needs
    - Tobacco
  - Clinical Conditions
    - Active Caries
    - Plaque
    - Tooth Morphology
    - Root exposure
    - Dental History
    - Attachment Loss
    - Quality of previous dental care
    - Dry Mouth
    - Timely completion of care

Each Line Item Scored as:
Low = 0
Moderate = 1
High = 5

Pediatric Scale

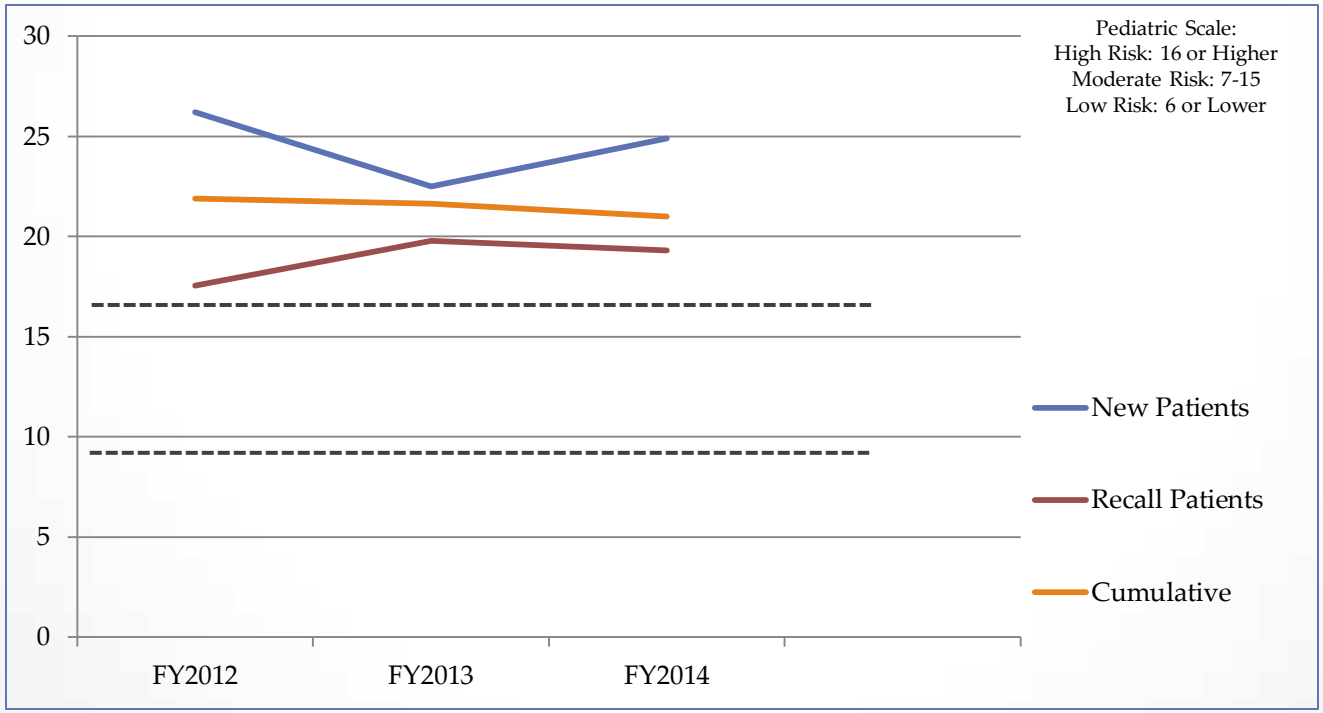
High Risk: 16 or Higher

Moderate Risk: 7-15

Low Risk: 6 or Lower

OHRA Scoring

- Used as a companion with EVT Coding to help shape clinical and operational decision making
- Evaluate performance of program as a whole
- Determine areas of highest need



OK, So now what?

- First analysis of its type that looks at a snapshot of a year with multiple year data (why we needed to pair with AFR)
- Need larger government/reputable organization supported study with larger sample size to create initial benchmark data and validate measurement tool
- This process can still be used to gauge quality improvement and practice translation
  - Compare and contrast clinics
  - Identify areas of need and areas if needed improvement
  - Evaluation of clinical policies and protocols (or changes in policy/procedure)
  - Compare and contrast providers (Accountability)

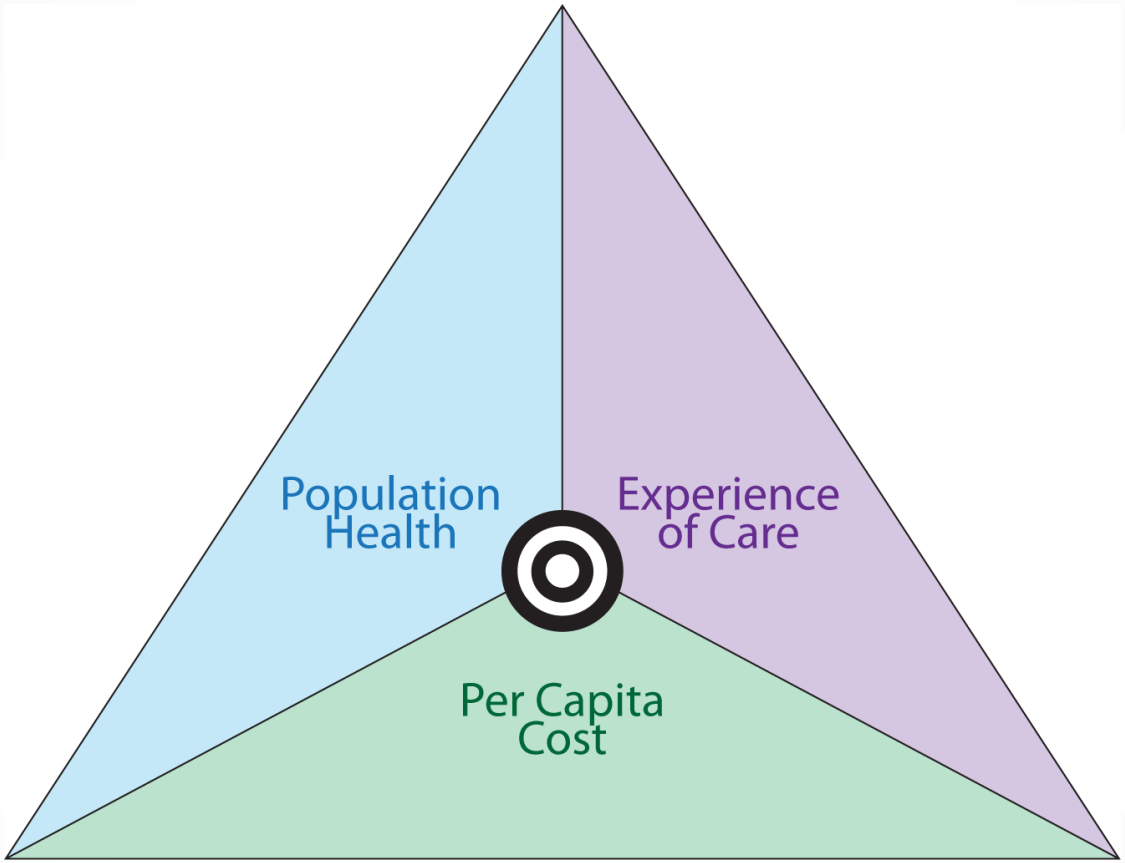
Future Considerations

- **EDRs currently are WAY BEHIND where we need them to be!!!!!!!!!!!!!!!!!!**
  - Extreme limitations with reporting of "Dummy codes"
  - Really focus on practice management and not really on clinical translation
- Currently cannot run comparative reports between codes, which requires manual evaluation and additional software (SNS, JMP, EXCEL)
  - Increases time of evaluation
  - Limited geographical information
- No built-in checks and balances to evaluate data entry
  - Have to have own audit procedures and process
- Extremely limited with comparative medical evaluation to improve integration of care
  - Meaningful use for dental lacks imagination and creativity
  - Leads to checking boxes and not to real patient impact

Barriers to Total Quality Implementation

- Changes the scope of service provision for the dental profession
- Everything built for volume and providing as many "high value" services as possible
- Fear of change/ Fear of evaluation / Fear of accountability
- A financial system geared to fee for service or volume of encounters
  - Funding sources
- Last several decades of focusing on quantitative output as success for "quality"
  - **LED TO A MISUNDERSTANDING OF WHAT QUALITY MEANS**

The Triple Aim



Gauging Impact from this Analysis

Triple Aim Impact

- **EXPERIENCE OF CARE**
- Patient Growth
  - **Year 2: 201% Growth**
  - **Year 3: 148% Growth**
- Patient Satisfaction
  - 97% "Top Box [Great/Good]" on 19 line-item (Portable) or 24 line-item (Fixed) satisfaction survey
- Quality of Care
  - Below or at low range level of Complications / AFR / Retention
    - Anesthesia
    - Restorative
    - Sealants (Preventive)
    - Endodontics
    - Oral Surgery

Triple Aim Impact

- **POPULATION HEALTH**
  - Defined as the health outcomes of a group of individuals, including the distribution of such outcomes within the group
  - Linking thread is the common focus on trying to understand the determinants of health of populations (why are some people healthy and others are not?)
  - Guiding principle is an increased focus on health outcomes (as opposed to quantity, processes, and products) and on determining the degree of change that can actually be attributed to 'our' work.
- Inter-linkage of EVT Coding
  - Impact of community outreach and changes on patient compliance to cost and/or AFR/retention
- Measuring tool (OHRA)
  - Using EVT Coding to impact clinical and operational decision making to reduce the oral health risk of the populations we serve
  - Using EDR to identify areas/regions/locations of susceptibility and evaluate cultural and educational issues/impacts/changes

Evans et al. (1994); Kindig & Stoddart (2003);
Health Canada (1998); Lavis et al. (2002)

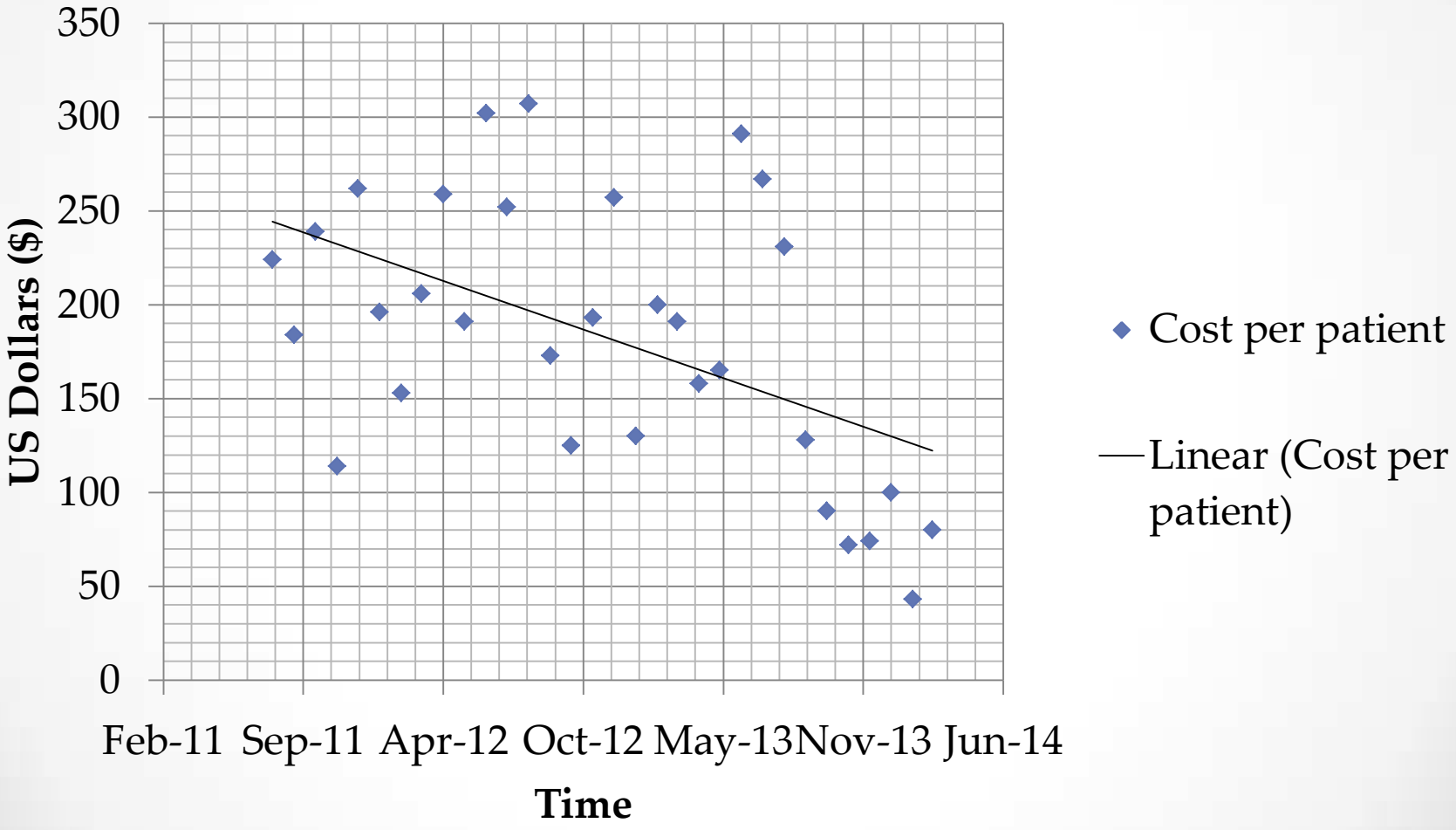
Triple Aim Impact

- **POPULATION HEALTH (Example: School Based Care)**

Description:	Overall	[redacted] County	[redacted] County	[redacted] County
Percentage of students seen at schools with services provided	20.4%	18.9%	18.1%	35.5%
Encounters per student	2.97	2.53	3.00	3.37
Percentage needing extractions	18.1%	18.6%	19.0%	12.1%
Percentage reporting no toothbrush at home	9.4%	9.9%	12.2%	5.8%
OHRA Scores	21.0 (High Risk)	21.0 (High Risk)	20.0 (High Risk)	21.1 (High Risk)

Triple Aim Impact

- **COST PER PATIENT**



References

--Boynes et al. Evaluating complications of local anesthesia administration and reversal with phentolamine mesylate in a portable pediatric dental clinic. *General Dentistry* 2013; 61: 70-76.

--Cheymol et al. Effects of obesity on pharmacokinetics: implications for drug therapy. Clinical Pharmacokinetics 2000; 39:215-231.

--Demarco et al. Longevity of posterior composite restorations: not only a matter of materials. Dental Materials 2012; 28:87-101.

--Ebbeling et al. Childhood obesity: public health crisis, common sense cure. Lancet 2002; 360:473-482.

--Evans et al. Why are some people health and others not? The determinants of health of populations. New York: Aldine de Gruyter; 1994.

--Farooq et al. Success rates of formocresol pulpotomy and indirect pulp therapy in the treatment of deep dentinal caries in primary teeth. Pediatric Dentistry 2000; 22:278-286.

--Feigal. Sealants and preventive restorations review of effectiveness. Pediatric Dentistry 1998;20:85-92.

--Health Canada. Taking Action on Population Health. Ottawa, Ontario: Health Canada; 1998.

--Hickel & Manhart. Longevity of restorations in posterior teeth and reasons for failure. J of Adhesive Dentistry 2001; 3:45-64.

--Jokstad et al. Quality of dental restorations: FDI commission project 2-95. FDI/World Dental Press. Oslo, Norway, 2001.

--Jones et al. Quality assurance and benchmarking: an approach for European dental schools. *European Journal of Dental Education*, 2007; *11*, 137-143.

--Kindig and Stoddart. What is population health? Am J Public Health 2003;93:380-383.

References

--Lavis et al. Examining the roleof health services research in public policy making. Milbank Q. 2002; 80:125-154.

--Lucarotti et al. Outcome of direct restorations placed within the general dental services in England and Wales (Part 3): variation by dentist factors. J of Dentistry 2005; 33:827-835.

--Manhart et al. Review of the clinical survival of direct and indirect restorations in posterior teeth of the permanent dentition. Oper Dent 2004; 29:481-508.

--McDonald and Avery. Treatment of deep caries, vital pulp exposure, and pulpless teeth. In McDonald/Avery. Dentistry for the child and adolescent, 6th Ed. St. Louis: CV Mosby Co, 1994.

--Mertz-Fairhurst et al.: A comparative clinical study of two pit and fissure sealants: 7-year results in Augusta, Georgia. J Am Dent Assoc 109:252-55, 1984

--Mjor. Amalgam and composite resin restorations: longevity and reasons for replacement. In; Anusavice K {ed¡. Quality evaluation of dental restorations. Chicago: Quintessence, 1989:61-80.

--Muller-Bolla et al. Effectiveness of school based dental sealant programs among children form low income backgrounds in France: A pragmatic randomized clinical trial. Community Dentistry & Oral Epidemiology 2013; 41:232-241.

--Nirschl and Avery. Evaluation of a new pulp capping agent in indirect pulp therapy. ASDC J Dent Child 1983; 50:25-30.

--Opdam et al. Longevity and reasons for failure of sandwich and total etch posterior composite resin restorations. J Adhesive Dentistry 2007; 9:469-475.

--Poorterman et al. Quality assurance in dentistry the Dutch approach. International Journal for Quality in Health Care. 1998; 10:345-350.

--Shugars and Bader. Cost implications of differences in dentists' restorative treatment decisions. Public Health Dentistry 1996; 56:219-222.

Any Questions?